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Solid biofuels and pyrogenic biocarbon - Determination of sulfur and chlorine content (ISO 16994:2026)

Táto norma obsahuje anglickú verziu európskej normy.

This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 08/26

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Supersedes EN ISO 16994:2016

English Version

**Solid biofuels and pyrogenic biocarbon - Determination of
sulfur and chlorine content (ISO 16994:2026)**

Biocombustibles solides et biocarbone pyrogène -
Détermination de la teneur en soufre et en chlore (ISO
16994:2026)

Biogene Festbrennstoffe - Bestimmung des
Gesamtgehaltes an Schwefel und Chlor (ISO
16994:2026)

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EN ISO 16994:2026 (E)

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European foreword

This document (EN ISO 16994:2026) has been prepared by Technical Committee ISO/TC 238 "Solid Biofuels and Pyrogenic Biocarbon" in collaboration with Technical Committee CEN/TC 335 "Solid Biofuels and Pyrogenic Biocarbon" the secretariat of which is held by SIS.

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of an identical text or by endorsement, at the latest by December 2026, and conflicting national standards shall be withdrawn at the latest by December 2026.

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Endorsement notice

The text of ISO 16994:2026 has been approved by CEN as EN ISO 16994:2026 without any modification.



International Standard

ISO 16994

Solid biofuels and pyrogenic biocarbon — Determination of sulfur and chlorine content

*Biocombustibles solides et biocarbone pyrogène —
Détermination de la teneur en soufre et en chlore*

**Third edition
2026-06**

ISO 16994:2026(en)



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ISO 16994:2026(en)**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 238, *Solid biofuels and pyrogenic biocarbon*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 335, *Solid Biofuels and Pyrogenic Biocarbon*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 16994:2016), which has been technically revised.

The main changes are as follows:

- fluorine and bromine added to the scope and calculation in [9.2](#);
- normative references updated;
- detection methods updated and additional details about the techniques added;
- decomposition method with acid digestion and ICP analyses for chlorine removed.

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.

ISO 16994:2026(en)

Introduction

Sulfur and chlorine are present in solid biofuels and pyrogenic biocarbon in varying concentrations. During the combustion process, they are usually converted to sulfur-oxides and chlorides. The presence of these elements and their reaction products can contribute significantly to corrosion and to environmentally harmful emissions.

Chlorine can be present in different organic and inorganic compounds and can exceed or equal the water-soluble amount that can be determined by ISO 16995.

Fluorine and bromine can also be present in solid biofuels and pyrogenic biocarbon, but in detectable concentration only in specific types of biomass, like in aquatic biofuels (Br) or as contamination because of chemical treatment (F). Both elements can be analysed using the same techniques and equipment as for chlorine and sulfur described in this document.

Combustion in an oxygen atmosphere in a closed combustion vessel is the preferred method to digest biomass samples for a determination of sulfur, chlorine, fluorine and bromine content. An advantage of the method is that the digestion can be carried out in connection with the determination of the calorific value according to ISO 18125. Other analytical techniques may also be used for selected analytes. The determination of the resultant chlorine, sulfur, bromine and fluorine compounds can be done by different techniques.

Automatic equipment and alternative methods may also be used for selected analytes.

A list with typical sulfur, chlorine and fluorine contents of solid biofuels can be found in ISO 17225-1:2021, Annex B.

Solid biofuels and pyrogenic biocarbon — Determination of sulfur and chlorine content

1 Scope

This document describes methods for the determination of sulfur and chlorine content in solid biofuels and pyrogenic biocarbon and specifies two methods for decomposition of the fuel and different analytical techniques for the quantification of the elements in the decomposition solutions. The determination of other elements such as fluorine and bromine are also possible with the methods in this document, however performance data for these elements are not provided. The use of automatic equipment is also included in this document, provided that a validation is carried out as specified and that the performance characteristics are similar to those of the method described in this document.

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 10304-1, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate*

ISO 14780, *Solid biofuels — Sample preparation*

ISO 16559, *Solid biofuels — Vocabulary*

ISO 18125, *Solid biofuels — Determination of calorific value*

ISO 18134-3, *Solid biofuels — Determination of moisture content — Part 3: Moisture in general analysis sample*

CEN Guide 13:2008, *Validation of environmental test methods*

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