
**Solid biofuels — Determination of
off-gassing and oxygen depletion
characteristics —**

**Part 2:
Operational method for screening of
carbon monoxide off-gassing**

*Biocombustibles solides — Détermination des caractéristiques de
dégagement gazeux et d'appauvrissement en oxygène —*

*Partie 2: Méthode opérationnelle d'analyse d'un dégagement de
monoxyde de carbone*



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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 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 238, *Solid biofuels*.

A list of all parts in the ISO 20048 series can be found on the ISO website.

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

There is continuous global growth in production, storage, handling, bulk transport and use of solid biofuels, especially in the form of pelletized biofuels.

The specific physical and chemical characteristics of solid biofuels, their handling and storage can lead to a risk of fire and/or explosion, as well as health risks such as intoxication due to exposure to carbon-monoxide, asphyxiation due to oxygen depletion or allergic reactions.

Emissions from pellets or biomass stored in enclosed spaces represent a significant health risk due to exposure to carbon monoxide (CO) and oxygen depletion. It is important to be able to assess the risk by quantifying the emission of CO in combination with oxygen levels. This document describes a method for estimating the propensity of a particular quality of pellets or biomass to emit CO, CO₂ and CH₄, as well as the depletion of oxygen within the stored environment. In a confined space, the gas composition can result in a toxic and explosive atmosphere.

Biomass species, the age of the material and the ambient temperature all impact the dynamics of gas emissions. Unless the level of CO and oxygen levels are well understood in an operating environment, there are inherent risks for workers, which have implications for liability.

The ISO 20048 series specifies a methodology to measure the emission of off-gases and depletion of oxygen. ISO/TS 20048-1 specifies a method for measuring the emission and depletion factor and emission and depletion rate of off-gassing in combination with oxygen depletion for gas species emitted in an enclosed storage for biomass. This document specifies a method to be used in preliminary screening of CO for operational planning. The results of the determination method described in this document should only be used for preliminary screening for operational planning. To analyse the potential for off-gassing and oxygen depletion of a densified biofuel, this document presents a standardized operational method which can assess the potential for CO emission.

Solid biofuels — Determination of off-gassing and oxygen depletion characteristics —

Part 2:

Operational method for screening of carbon monoxide off-gassing

1 Scope

This document specifies an operational method for screening of carbon monoxide off-gassing from solid biofuel pellets. It provides requirements for sampling and establishes procedures for sample handling of solid biofuel pellets prior to the analysis of off-gassing. This document specifies the applicability and use of the method. Guidance on the applicability and use of the data is given.

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 14780, *Solid biofuels — Sample preparation*

ISO 18135, *Solid Biofuels — Sampling*

ISO 21945, *Solid biofuels — Simplified sampling method for small scale applications*

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

test sample

laboratory sample after an appropriate preparation made by the laboratory

Note 1 to entry: The test sample is here typically a representative sample from a batch of pelletized biofuels.

[SOURCE: ISO 16559:2022, 3.199, modified — note to entry replaced.]

3.2

test portion

sub-sample either of a *laboratory sample* (3.4) or a *test sample* (3.1)

[SOURCE: ISO 16559:2022, 3.198, modified — note to entry removed.]