INTERNATIONAL STANDARD

ISO 20048-2

First edition
2023-01

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

Reference number
ISO 20048-2:2023(E)

© ISO 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2023 – All rights reserved

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Principle **2**
5 Apparatus **2**
6 Sample handling **3**
6.1 Sampling 3
6.2 Sample transport and storage 4
6.3 Sample preparation 4
7 Procedure **4**
8 Results **6**
9 Calibration of instruments **6**
10 Test report **7**
Annex A (informative) **Support material for procedure** **8**
Annex B (informative) **Example of test report template** **10**
Bibliography **12**

© ISO 2023 – All rights reserved

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.

© ISO 2023 – All rights reserved

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, CO_2 and CH_4, 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.

© ISO 2023 – All rights reserved

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.]

© ISO 2023 – All rights reserved

3.3
sample
quantity of material (all increments), representative of a larger quantity for which the quality is to be determined

[SOURCE: ISO 16559:2022, 3.168, modified — note to entry removed.]

3.4
laboratory sample
sample (3.3) delivered to a laboratory

[SOURCE: ISO 16559:2022, 3.120, modified — note to entry removed.]

3.5
off-gassing
spontaneous emission of condensable gases (e.g. terpenes) and non-condensable gases (e.g. carbon-monoxide, carbon-dioxide, methane) from biomass

[SOURCE: ISO 16559:2022, 3.141]

3.6
specific maximum CO concentration
maximum measured CO concentration divided by the mass (in kg) of the test portion in the test container

4 Principle

The concentration of CO is measured over time at a given set temperature using an enclosed heating apparatus (e.g. an incubator or an oven) with a fan and the sample container suspended to allow the even distribution of heated air. The method is designed to measure two sets of replicates.

NOTE The sample material is subject to auto-oxidation. The oxygen level in the container gradually decreases and the CO level increases until the oxygen is depleted.

Additionally, off-gassing potential (and self-heating) declines with time, therefore the sample shall be analysed without any time delay.

The sample material may be processed either in an in-house company laboratory or by an external laboratory.

5 Apparatus

5.1 Sample container, nominal volume 1 l, cylindrical container made of glass with a sealed glass or metallic lid for an airtight fit (see Figure 1). Containers without a neck should be used.

The nominal volume of 1 l containers can vary significantly. Limit the actual volume of the containers to 1 045 ml to 1 130 ml.

© ISO 2023 – All rights reserved