SLOVENSKI STANDARD
SIST-TS CEN ISO/TS 21911-2:2022

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Trdno alternativno gorivo - Določanje samosegrevanja - 2. del: Preskusi ogrevanja košare (ISO/TS 21911-2:2022)

Solid recovered fuels - Determination of self-heating - Part 2: Basket heating tests (ISO/TS 21911-2:2022)

Biogene Festbrennstoffe - Bestimmung der Selbsterhitzung - Teil 2: Warmlagerungsprüfungen im Drahtnetzkorb (ISO/TS 21911-2:2022)

Combustibles solides de récupération - Détermination de l'auto-échauffement - Partie 2: Essais utilisant la méthode du point de croisement (ISO/TS 21911-2:2022)

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ICS:

75.160.10	Trda goriva	Solid fuels

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English Version

Solid recovered fuels - Determination of self-heating - Part 2: Basket heating tests (ISO/TS 21911-2:2022)

Combustibles solides de récupération - Détermination de l'auto-échauffement - Partie 2: Essais utilisant la méthode du point de croisement (ISO/TS 21911-2:2022)

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This Technical Specification (CEN/TS) was approved by CEN on 3 July 2022 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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European foreword

This document (CEN ISO/TS 21911-2:2022) 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 materials, including solid recovered fuels” the secretariat of which is held by SFS.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO/TS 21911-2:2022 has been approved by CEN as CEN ISO/TS 21911-2:2022 without any modification.

TECHNICAL SPECIFICATION

ISO/TS 21911-2

First edition
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Solid recovered fuels — Determination of self-heating —

Part 2: Basket heating tests

Combustibles solides de récupération — Détermination de l'auto-échauffement —
Partie 2: Essais utilisant la méthode du point de croisement

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

A list of all parts in the ISO 21911 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 trading and use of solid recovered fuels (SRFs). Therefore, intensive investigations about the risk of fires within SRF production, handling and storing have been conducted, see ÖNORM S 2098. Recommendations are given in ISO 21912.

Depending on the kind of input wastes, the treatment technology applied, the quality of the SRF produced and the realized storage versions, SRFs can generate heat spontaneously by exothermic biological, chemical and physical processes. The heat build-up can be significant in large storage volumes if the heat conduction in the material is low. During some conditions the heat generation can lead to pyrolysis and spontaneous ignition. The potential for self-heating varies considerably for different types and qualities of SRF and it is important to be able to identify SRF fractions with high heat generation potential to avoid fires in stored materials.

Avoiding fires throughout the production and supply chain will have positive consequences on the acceptance of SRFs and the costs for insurance coverage,

Application of SRF standards and the use of dedicated standards for the determination of self-heating will help to reduce the risk of fires and to develop tailor-made recommendations for SRF producers, logistics providers, SRF users, equipment suppliers or manufacturers, consultants, authorities and insurance providers.

As part of the determination and the assessment of risks for SRF, defined test methods and standards are established or need to be developed. However, ageing and degradation due to handling and storage of SRF in actual environments affects their characteristics, so safety margins should be established in relation to actual analysis results.

Two intrinsically different types of test methods can be used to estimate the potential of self-heating;

a) In the isothermal calorimetry method described in ISO 21911-1[1)], the heat flow generated from the test portion is measured directly.

b) In the basket heating tests described in this document, the temperature of the test portion is being monitored and the critical ambient temperature (CAT), where the temperature of the test portion does not increase significantly due to self-heating, is used for indirect assessment of self-heating.

These two methods are applied at different analysis temperature regimes. The operating temperature for an isothermal calorimeter is normally in the range 5 °C to 90 °C, whereas basket heating tests are conducted at higher analysis (oven) temperatures.

NOTE 1 These two types of test methods do not measure heat production from physical processes, such as transport of moisture.

NOTE 2 It is likely that oxidation reactions taking place in the low respective high-temperature regimes for SRFs are of different character and thus have different reaction rates and heat production rates. In such cases, extrapolation of the data from a high-temperature test series can lead to non-conservative results and will possibly not be applicable without taking the low-temperature reactions into account. In the general case of two reactions with different activation energies, the high activation energy is “frozen out” at low temperatures and the low activation energy reaction is “swamped” at higher temperatures[7].

Basket heating tests have been used traditionally for characterization of the tendency for spontaneous ignition of predominantly coals, but also for other reactive organic materials, such as cottonseed meal, bagasse and milk powder[9]. The principle used in these types of test is to find the CAT for a self-heating sample material of specific size and geometry.

There are several different methods described in the literature with different degrees of sophistication. The variations span from simple pass and fail tests to more advanced tests from which data on reaction rates can be extracted[10].

1) In preparation. Stage at the time of publication: ISO/FDIS 21911-1:2022.

Basket heating tests are useful for assessment of self-heating of SRFs. The test method selected can be evaluated for its applicability based on the information given in this document.

A compilation of available basket heating test methods is given in this document. Guidance on the suitability for application of these methods for tests with SRFs is provided.

Basic theory of the use of basket heating test data for calculations of critical conditions in storage is provided in Annex C.

The test methods presented require representative samples for the conditions prevailing in the process (e.g. of SRF storage). Sample preparation is necessary for this purpose. The methods presented are not suitable for assessing the fire hazard caused by impurities (disturbing materials) as they occur mainly in the input area and the first steps of SRF production.

Solid recovered fuels — Determination of self-heating —

Part 2: Basket heating tests

1 Scope

This document gives guidance on basket heating tests for characterization of self-heating properties of solid recovered fuels (SRFs).

This document includes:

a) a compilation of basket heating test methods;

b) guidance on the applicability and use of basket heating tests for SRF;

c) information on the application of basket heating test data for calculations of critical conditions in storage.

Data on spontaneous heat generation determined using this document is only associated with the specific quality and age of the sample material.

The information derived using this document is intended for use in quality control and in hazard and risk assessments related to the procedures given in ISO 21912.

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 21646, *Solid recovered fuels — Sample preparation*

ISO 21637:2020, *Solid recovered fuels — Vocabulary*

ISO 21645, *Solid recovered fuels — Methods for sampling*

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 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
analysis temperature
temperature of the analysis environment, i.e. the oven temperature