



SLOVENSKI STANDARD
SIST-TS CEN/TS 15290:2006

01-maj-2006

Trda goriva - Določitev glavnih elementov

Solid Biofuels - Determination of major elements

Feste Biobrennstoffe - Bestimmung von Hauptelementen

Biocombustibles solides - Détermination des éléments mineurs

Ta slovenski standard je istoveten z: CEN/TS 15290:2006

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ICS:

75.160.10 Trda goriva Solid fuels

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TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CEN/TS 15290

March 2006

ICS 75.160.10

English Version

Solid Biofuels - Determination of major elements

Biocombustibles solides - Détermination des éléments
mineurs

Feste Biobrennstoffe - Bestimmung von Hauptelementen

This Technical Specification (CEN/TS) was approved by CEN on 22 November 2005 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.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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Foreword

This Technical Specification (CEN/TS 15290:2006) has been prepared by Technical Committee CEN/TC 335 “Solid biofuels”, the secretariat of which is held by SIS.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

The elements described as major elements of solid biofuels are in fact major elements of the fuel ashes more than of the fuels. The determination of these elements may 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.

In this Technical Specification, wet chemical methods are described. As an alternative, X-ray fluorescence (XRF) may be used when validated with suitable materials (biomass reference materials).

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1 Scope

This Technical Specification describes methods for the determination of major elements of solid biofuels respectively of their ashes, which are Al, Ca, Fe, Mg, P, K, Si, Na, Ti. The determination of barium (Ba) and manganese (Mn) is also possible with the methods described in this Technical Specification.

The Standard includes two parts: Part A describes the direct determination on the fuel, this method is also applicable for sulfur and minor elements, part B gives a method of determination on a prepared 550°C ash.

2 Normative references

The following referenced documents are indispensable for the application 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.

CEN/TS 14588:2003, *Solid biofuels – Terminology, definitions and descriptions*

CEN/TS 14775, *Solid biofuels – Methods for the determination of ash content*

CEN/TS 14780, *Solid biofuels – Methods for sample preparation*

prCEN/TS 15296, *Solid biofuels – Calculation of analyses to different bases*

EN ISO 7980, *Water quality – Determination of calcium and magnesium – Atomic absorption spectrometric method (ISO 7980:1986)*

EN ISO 11885, *Water quality – Determination of 33 elements by inductively coupled plasma atomic emission spectrometry (ISO 11885:1996)*

EN ISO 17294-2, *Water quality – Application of inductively coupled plasma mass spectrometry (ICP/MS) – Part 2: Determination of 62 elements (ISO 17294-2:2003)*

ISO 9964-1, *Water quality – Determination of sodium and potassium – Part 1: Determination of sodium by atomic absorption spectrometry*

ISO 9964-2, *Water quality – Determination of sodium and potassium – Part 2: Determination of potassium by atomic absorption spectrometry*

ISO 9964-3, *Water quality – Determination of sodium and potassium – Part 3: Determination of sodium and potassium by flame emission spectrometry*

3 Terms and definitions

For the purposes of this Technical Specification, the terms and definitions given in CEN/TS 14588:2003 apply.

4 Symbols and abbreviations

4.1 Symbols

Al Aluminium

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Ca Calcium

Fe Iron

Mg Magnesium

P Phosphorus

K Potassium

Si Silicon

Na Sodium

Ti Titanium

4.2 Abbreviations

ICP-OES Inductively Coupled Plasma – Optical Emission Spectrometry

ICP-MS Inductively Coupled Plasma – Mass Spectrometry

FAAS Flame Atomic Absorption Spectrometry

FES Flame Emission Spectrometry

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5 Principle

The sample is digested in a closed vessel by the help of reagents, temperature and pressure. The digestion is either carried out directly on the fuel (part A) or on a 550 °C prepared ash (part B).

The detection of the elements may be done by Inductively Coupled Plasma Optical Emission Spectrometry (ICP/OES), Inductively Coupled Plasma Mass Spectrometry (ICP/MS) or Flame Atomic Absorption Spectrometry (FAAS).

6 Reagents**6.1 General**

All reagents should be of analytical grade or better. If minor elements are also to be determined, the best qualities should be used.

6.2 Water

Water containing negligible amounts of major elements, i.e. amounts that do not contribute significant to the determinations. Deionised water will normally fulfil this requirement.

6.3 Nitric acid (HNO₃)

65 % (w/w), $\rho = 1.40$ g/ml

6.4 Hydrogen peroxide (H₂O₂)

30 % (w/w), $\rho = 1.11$ g/ml

6.5 Hydrofluoric acid (HF)

40 % (w/w), $\rho = 1.13$ g/ml

CAUTION — Hydrofluoric acid may lead to health hazards.

6.6 Boric acid (H_3BO_3)

4 % (w/w)

7 Apparatus

7.1 Heating oven or heating block suitable for the decomposition system in use

Resistance heated oven or heating block that can be used at a temperature of at least 220°C with an accuracy of $\pm 10^\circ\text{C}$.

7.2 Microwave oven

Intended for laboratory use and preferably equipped with temperature control.

7.3 Sample digestion vessels

Intended for the heating system used, normally made of a fluoro plastic.

7.4 Balance

With a resolution of least 1 mg.

7.5 Plastic volumetric flasks

8 Preparation of the test sample

The test sample is the general analysis test sample with a nominal top size of 1 mm or less, prepared in accordance with CEN/TS 14780.

The results are to be calculated on a dry basis. Therefore the moisture content of the test sample should be determined as described in CEN/TS 14774-3.

9 Procedure

9.1 Digestion

NOTE Hydrofluoric acid may cause volatile compounds during the digestion.

9.1.1 Part A: Direct determination on the fuel

The decomposition shall be carried out in closed vessels. It can be done in a heating oven, a heating block or in a microwave oven.