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Solid biofuels - Method for the determination of ash melting behaviour - Part 1: Characteristic temperatures method

Biocombustibles solides - Méthode de détermination de la fusibilité des cendres - Partie 1: Méthode des températures caractéristiques

Feste Biobrennstoffe - Verfahren zur Bestimmung des Schmelzverhaltens der Asche - Teil 1: Verfahren zur Bestimmung charakteristischer Temperaturen

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Contents

Page

Foreword

This document (CEN/TS 15370-1:2006) 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 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.

Introduction

Ash melting is a complex process where also sintering, shrinkage and swelling can occur.

The test method described in this Technical Specification provides information about fusion and melting behaviour of the composite inorganic constituents of the fuel ash at high temperatures.

The test method is empirical. The ash used for the test is a homogeneous material, prepared from the fuel, and the determination is performed at a controlled rate of heating in a controlled atmosphere. In contrast, under full-scale conditions, the complex processes of combustion and fusion involve heterogeneous mixtures of particles, variable heating rates and gas compositions.

The determined characteristic temperatures in the test can be used for comparison of the tendency of the ashes from different types and qualities of solid biofuels to form fused deposits or to cause bed agglomeration on heating.

The method is based on the methods described in ISO 540:1995 and DIN 51730:1998.

The terms ash fusibility and ash softening are synonyms to ash melting.

1 Scope

This document specifies a method for the determination of the characteristic temperatures for the ash melting behaviour of solid biofuels.

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 14775:2004, *Solid Biofuels –Method for the determination of ash content*

3 Terms and Definitions

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

3.1
Shrinkage starting temperature
(abbreviation: SST): The temperature at which shrinking of the test piece occurs. This temperature is defined as when the area of the test piece falls below 95 % of the original test piece area at 550 ^{o}C.

NOTE Shrinking may be due to liberation of carbon dioxide, volatile alkali compounds, and/or sintering.

3.2
Deformation temperature
(abbreviation: DT): The temperature at which the first signs of rounding of the edges of the test piece occurs due to melting.

NOTE For computerised evaluation a shape factor change of 15 % marks the deformation temperature. For definition of shape factor see normative Annex A.

3.3
Hemisphere temperature
(abbreviation: HT): The temperature at which the test piece forms approximately a hemisphere i.e. when the height becomes equal to half the base diameter.

3.4
Flow temperature
(abbreviation: FT): The temperature at which the ash is spread out over the supporting tile in a layer, the height of which is half of the height of the test piece at the hemisphere temperature.

NOTE Half of the height of the test piece has been defined due to frequently occurring bubbling effects. This is especially important for automatic image evaluation. Be aware that this definition is different to other standards.

4 Principle

A test piece made from a prepared ash is heated up with constant rate and continuously observed. The temperatures at which characteristic changes of the shape occur are recorded. The characteristic temperatures are defined in Clause 3 (see also Figure 1).