

ICS 75.160.10

English Version

**Solid recovered fuels - Methods for the determination of the  
content of trace elements (As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mo,  
Mn, Ni, Pb, Sb, Se, Ti, V and Zn)**

Combustibles solides de récupération - Méthodes pour la  
détermination de la teneur en éléments traces (As, Ba, Be,  
Cd, Co, Cr, Cu, Hg, Mo, Mn, Ni, Pb, Sb, Se, Ti, V et Zn)

Feste Sekundärbrennstoffe - Verfahren zur Bestimmung  
des Gehaltes an Spurenelementen (As, Ba, Be, Cd, Co, Cr,  
Cu, Hg, Mo, Mn, Ni, Pb, Sb, Se, Ti, V and Zn)

This Technical Specification (CEN/TS) was approved by CEN on 25 March 2006 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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## Foreword

This document (CEN/TS 15411:2006) has been prepared by Technical Committee CEN/TC 343 “Solid Recovered Fuels”, the secretariat of which is held by SFS.

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.

## Introduction

Accurate determination of trace element content in solid recovered fuels is important for environmental and technical reasons both in the production and combustion stage. After digestion of the solid recovered fuels using different methods, a number of analytical techniques can be used for the quantification of the trace element content. They include Inductively Coupled Plasma with optical or mass detection, graphite furnace Atomic Absorption Spectrometry and, when available, dedicated specific method (e.g. for mercury).

## 1 Scope

This Technical Specification specifies three methods of digestion for solid recovered fuels:

- a) microwave assisted digestion with hydrofluoric, nitric and hydrochloric acid mixture;
- b) hot water bath digestion with hydrofluoric, nitric and hydrochloric acid mixture, after ashing of the SRFs sample;
- c) oven digestion with nitric, perchloric and hydrofluoric acid mixture.

Instrumental determination of As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Sb, Se, Tl, V, Zn is performed by Inductively Coupled Plasma with optical or mass detection or graphite furnace Atomic Absorption Spectrometry. Hg can be analysed only after the microwave assisted procedure or, alternatively, by a direct analysis method.

The effectiveness of the digestion can be verified by qualitative X-ray fluorescence (XRF) analysis on the remaining residue. If necessary an alternative digestion method (among those proposed) is used.

Method a) is recommended for general use, but the amount of the test portion can be very low in case of high concentration of organic matter.

Method b) is recommended for SRFs with high organic matter concentration that can be difficult to digest with the other methods. This method is not suitable for mercury.

Method c) is recommended for SRFs samples for which the other methods leave a significant insoluble residue.

## 2 Normative references

The following referenced documents are indispensable for the application of this Technical Specification. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13656, *Characterization of waste — Microwave assisted digestion with hydrofluoric (HF), nitric (HNO<sub>3</sub>) and hydrochloric (HCl) acid mixture for subsequent determination of elements*

CEN/TS 15357:2006, *Solid recovered fuels — Terminology, definitions and descriptions*

prCEN/TS 15403, *Solid recovered fuels — Methods for the determination of the ash content*

CEN/TS 15413, *Solid recovered fuels — Methods for the preparation of the test sample from the laboratory sample*

prCEN/TS 15414-3, *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 3: Moisture in general analysis sample*

EN ISO 3696:1995, *Water for analytical laboratory use — Specification and test methods (ISO 3696:1987)*

## 3 Terms and definitions

For the purposes of this Technical Specification, the terms and definitions given in CEN/TS 15357:2006 and the following apply.