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## Solid biofuels — Terminology, definitions and descriptions

*Biocarburants solides — Terminologie, définitions et descriptions*

ICS 01.040.75; 27.190; 75.160.10

### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

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## Foreword

This document has been prepared by ISO/TC 238 "Solid biofuels".

This document is a working document.

DRAFT 2013

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## Introduction

This International Standard has been written in accordance with ISO 10241. This International Standard is based on international standard EN 14558:2010 [13] as well as on approved national standards and manuals. Some of the terms included in this International Standard are only used in particular countries.

In this International Standard instead of the legal definition *waste* the technical terms *residue*, and *by-product* are used to describe co-products from forestry and arboriculture, agriculture and horticulture, and aquaculture as well as related industries. The terms and definitions are harmonised as far as possible with the current language used in management as well as in regulatory activities.

### 1 Scope

This international standard determines the terminology and definitions for solid biofuels. According to the scope of the ISO/TC 238 this standard only includes raw and processed material originating from

- forestry and arboriculture,
- agriculture and horticulture,
- aquaculture

NOTE 1 Raw and processed material includes woody, herbaceous, fruit and aquatic biomass from the sectors mentioned above.

NOTE 2 Chemically treated material may not include halogenated organic compounds and heavy metals more than typical virgin material values (see ISO document on fuel specification and classes Part I). Treatment by air, water and heat is considered not to be chemical treatment.

Solid biofuels originating from different recycling processes of end-of-life-products are not within the scope but relevant terms are included for information. Areas covered by ISO/TC28/SC7 "Liquid biofuels" and ISO/TC193 "Natural gas" are excluded.

Other standards with a different scope than this International Standard may have different definitions than this standard.

## 2 Normative references

This International Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

Not applicable.

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### 3 Principle

This International Standard only contains terms used to describe solid biofuels within the scope of ISO/TC 238, see Figure 1.

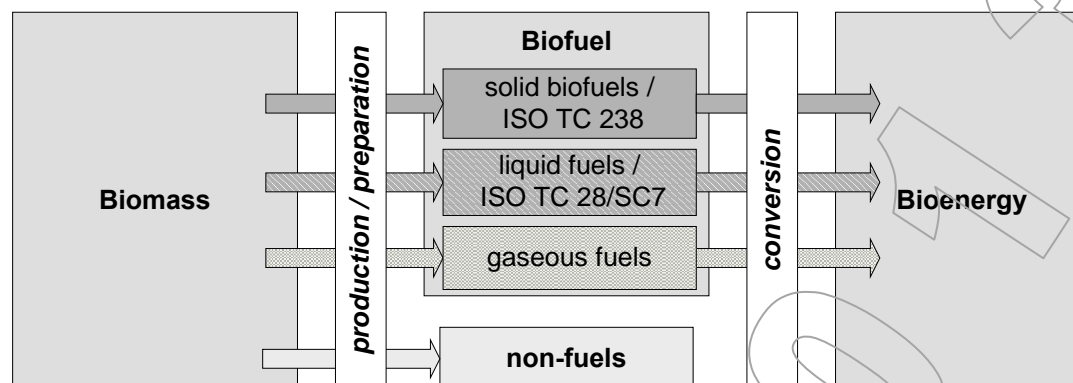


Figure 1 ISO/TC 238 within the biomass-biofuel-bioenergy field

Solid biofuels are produced from different sources, which are defined within the scope of ISO/TC 238 "Solid Biofuels". Terms and definitions are categorised in a logical structure based on the fact that solid biofuels are produced from different sources and that solid biofuels are used to produce bioenergy:

- origin and source of solid biofuels in the overall supply chain,
- the different traded forms as well as the different forms of biofuels produced within the preparation processes,
- the most relevant biofuel properties and terms of sampling and testing as well as classification and specification
- the description of the solid biofuels itself as well as their handling and processing given in the same structure as the biomass sources
- bioenergy as the result of solid biofuel conversion

Appropriate terms for sampling and testing as well as classification and specification of properties have to be defined and described together with the category *source/origin, type and properties of solid biofuels*. The necessity of terms defined in this International Technical Standard is in many cases based on the classification system of solid biofuels given in EN 14961-1:2010 [16], in which the classification of solid biofuels is specified in more detail.

## 4 Terms and definitions

### 4.1

#### absorption

phenomenon whereby atoms, ions, or molecules from a gas, liquid, or dissolved solid permeates or is dissolved by a liquid or solid (the absorbent). Note that adsorption is a surface-based process while absorption involves the whole *volume* of the material

### 4.2

#### adsorption

phenomenon whereby atoms, ions, or molecules from a gas, liquid, or dissolved solid adheres to a surface. The process creates a film of the adsorbate on the surface of the adsorbent

### 4.3

#### additive

material which has been intentionally introduced into the *fuel feedstock* to improve *quality of fuel* (e.g. combustion properties), reduce emissions or make production more efficient

NOTE Trace amounts of e.g. grease or other lubricants that are introduced into the *fuel* processing stream as part of normal mill operations are not considered as *additives*.

### 4.4

#### agrofuels

*biofuels* obtained from *energy crops* and/or agricultural by-products (agricultural residues)

NOTE Adapted from FAO unified *bioenergy* terminology (UBET)

### 4.5

#### air dried

condition in which the *solid biofuel* has dried in air to equilibrium *moisture content*.

NOTE 1 Adapted from ISO 1213-2:1992 [19]

### 4.6

#### angle (critical angle) of repose

steepest angle of descent measured in degrees of the slope of material relative to the horizontal plane when granular material on the slope face is on the verge of sliding. The slope may be the convex perimeter of a conical pile on a flat surface.

### 4.7

#### angle of drain

steepest angle of descent measured in degrees of the slope of material relative to the horizontal plane when granular material on the slope face is on the verge of sliding. When *biomass* is held in a silo or hopper and drained through a gate at the bottom the material is usually forming a cone within which the material, especially material with high *particle* aspect ratio such as pellets, partially becomes interlocked before released by the forces of gravity. The angle of drain is normally a few degrees higher than the angle of repose.

### 4.8

#### animal biomass

*biomass* obtained from livestock

### 4.9

#### animal by-products, animal residues

agricultural by-products (or agricultural residues) obtained from livestock operations

NOTE 1 It includes among others solid excreta of animals.

### 4.10

#### aquatic biomass

*biomass* reared in water

**4.11****as analysed, determined basis**

condition in which the *moisture content* of the *solid biofuel* is the content of the material at the moment of analysis/determination

NOTE Adapted from ISO 1213-2:1992 [19]

**4.12****as received, as delivered**

calculation basis for a material in the delivery state

NOTE 1 The abbreviation of as received is ar

**4.13**

ash, ash content (A)

mass of inorganic residue remaining after combustion of a *fuel* under specified conditions, typically expressed as a percentage of the mass of *dry matter* in *fuel*

NOTE 1 See also *ash fusibility*, *natural ash*, *extraneous ash*.

NOTE 2 Depending on the combustion efficiency the ash may contain combustibles.

NOTE 3 If a complete combustion is realised ash contains only inorganic, non-combustible components.

NOTE 4 Adapted from ISO 1213-2:1992 [19]

**4.14**

ash deformation temperature (DT)

temperature at which first signs of rounding due to melting of the edges of the *ash* test piece occur

NOTE Adapted from ISO 540:2008 [18]

**4.15****ash flow temperature (FT)**

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 *ash hemisphere temperature*

NOTE Adapted from ISO 540:2008 [18]

**4.16****ash fusibility, ash melting behaviour**

characteristic physical state of the *ash* obtained by heating under specific conditions

NOTE 1 *Ash fusibility* is determined under either oxidizing or reducing conditions.

NOTE 2 See also *ash deformation temperature*, *ash flow temperature* and *ash hemisphere temperature*

**4.17****ash hemisphere temperature (HT)**

temperature at which the height of a test piece, prepared from *ash* by a specific procedure, is equal to half the width of the base, and its shape becomes approximately hemispherical

NOTE Adapted from ISO 540:2008 [18]

**4.18****ash shrinkage starting temperature (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°C.

**4.19****bag weight**

weight of the *fuel* plus the bag



**4.20****baled biofuel, bale**

*solid biofuel* which has been compressed and bound to keep its shape and *density*

EXAMPLE Straw bales, bales of *energy grass*, bales of treetops and branches

**4.21****bark**

organic cellular tissue which is formed by taller plants (trees, bushes) on the outside of the growth zone (cambium) as a shell for the wooden body

**4.22****basic density**

ratio of the mass on *dry basis* and the *solid volume* on green basis

**4.23****biobased**

derived from *biomass*

**4.24****biobased product, biobased industrial product, bioproduct**

product wholly or partly *biobased*

NOTE 1 The *biobased product* is normally characterized by the *biobased* content.

NOTE 2 Adopted from CEN/BT/WG209 biobased products [11].

**4.25****bioenergy**

renewable energy source produced from *biomass*

NOTE *Biomass* may either be used directly as a *fuel* or processed into liquids or gases.

**4.26****biofuel**

solid, liquid or gaseous *fuel* produced directly or indirectly from *biomass*

**4.27****biofuel blend**

*biofuel* resulting from intentionally mixing of different *biofuels*

EXAMPLE Straw or *energy grass* with wood, dried *biosludge* with *bark*

**4.28****biofuel briquette**

*densified biofuel* made with or without *additives* in the form of cubiform, polyhedral, polyhydic or cylindrical units with a diameter of more than 25 mm, produced by compressing *biomass*

NOTE: usually the *biomass* has been milled before densification

**4.29****biofuel mixture**

*biofuel* resulting from natural or unintentional mixing of different *biofuels* and/or different types of *biomass*

**4.30****biofuel pellet**

*densified biofuel* made with or without *additives* in the form of cubiform, polyhedral, polyhydic or cylindrical units with a diameter up to 25 mm, produced by compressing *biomass*

NOTE: usually the *biomass* has been milled before densification

#### 4.31 biomass

is defined from a scientific and technical point of view as material of biological origin excluding material embedded in geological formations and/or transformed to fossil. Biomass is organic material that is plant or animal based, including but not limited to dedicated *energy crops*, agricultural crops and trees, food, feed and fiber crop *residues*, aquatic plants, alga, forestry and wood *residues*, agricultural wastes, processing by-products and other non fossil organic matter.

NOTE 1 Adopted from ANSI/ASABE S593.1 [1]

NOTE 2 See also *herbaceous biomass*, *fruit biomass*, and *woody biomass*.

#### 4.32 biomass by-product

a secondary product which is made incidentally during the production of something else

EXAMPLE sawdust when sawing timber

#### 4.33 biomass residue

*biomass* from well-defined side-streams from forestry, agricultural, aqua cultural and related industrial operations

EXAMPLE olive cake after pressing of oil, logging residues

#### 4.34 biomass resource owner

body or enterprise with the right to exploit the *biomass* resources for energy purposes

NOTE The *biomass* resource owner can be a land or forest owner, a company etc.

#### 4.35 biomethane

methane produced from *biomass* (e.g. *solid biofuels*)

NOTE Biomethane is not a *solid biofuel*. The term is included for information only.

#### 4.36 biosludge

sludge formed in the aeration basin during biological waste water treatment or biological treatment process and separated by sedimentation or flotation

NOTE 1 The sludge can be dewatered and further processed into *solid biofuel*.

NOTE 2 *Biosludge* is not a *solid biofuel*. The term is included for information only.

#### 4.37 black liquor

liquor obtained from wood during the process of pulp production, in which the energy content is mainly originating from the content of lignin removed from the wood in the pulping process

NOTE 1 Black liquor contains also pulping chemicals.

NOTE 2 Black liquor is not a *solid biofuel*. The term is included for information only.

#### 4.38 bridging, arching

hindering flow that occurs when *particles* form stable arch across an opening

NOTE Adapted to Woodcock and Mason. Bulk Solids Handling [29]

#### 4.39

**bulk density (BD)**

mass of a portion (i.e. a large quantity of particulate material) of a solid *fuel* divided by the *volume* of the container which is filled by that portion under specific conditions

NOTE 1 Adapted from ISO 1213-2:1992 [19]

**4.40****bulk volume, loose volume**

*volume* of a material including space between the *particles*

**4.41****bundled biofuel, bundle**

*solid biofuels* which has been bound together and where there is a lengthwise orientation of the material

EXAMPLE Bundles of *energy forest trees* and *logging residues*, small trees, or branches and tops.

**4.42****calorific value, heating value (q)**

energy amount per unit mass or *volume* released on complete combustion

NOTE See also *gross calorific value*, *energy density*, *net calorific value*,

**4.43****cereal crops**

annual crops grown with the main purpose of using the seed for food production

NOTE Some cereal crops can be used as a *solid biofuel*.

EXAMPLES barley, wheat, rye, oat

**4.44****certified reference material (CRM)**

*reference material*, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes traceability to an accurate realisation of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence

EXAMPLE NIST Standard Reference Material® SRM, CRM issued by NIST (national institute of standards and technology of the United States of America)

**4.45****char**

solid partially or non-agglomerated carbonaceous material produced from thermo-chemical *conversion* of *solid fuels*

NOTE Adapted from ISO 1213-2:1992 [19]

**4.46****charcoal, biochar, biocarbon, biocoke**

*solid biofuel* derived from carbonization distillation and *pyrolysis* of *biomass*

**4.47****chemical treatment**

any treatment with chemicals other than air, water or heat

**4.48****chopped straw**

straw which has been cut into small pieces

**4.49****chunkwood**

wood cut with sharp cutting devices where most of the material have typical *particle* lengths of 50 to 150 mm, which are substantially longer and coarser than *wood chips*