
Solid biofuels — Vocabulary

Biocombustibles solides — Vocabulaire

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 238, *Solid biofuels*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 335, *Solid biofuels*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 16559:2014), which has been technically revised. The main changes are as follows:

- [Clause 3](#) has been updated;
- the title of this document has been changed;
- [Annex A](#) has been added.

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

Some of the terms included in this document are only used in particular countries.

In this document, terms for virgin biomass, residue, and by-product are used to describe co-products from forestry, arboriculture, agriculture, horticulture and aquaculture as well as related virgin biomass industries. The terms and definitions are harmonized as far as possible with the current language used in management as well as in regulatory activities.

This document only contains terms used to describe solid biofuels within the scope of ISO/TC 238, see [Figure 1](#).

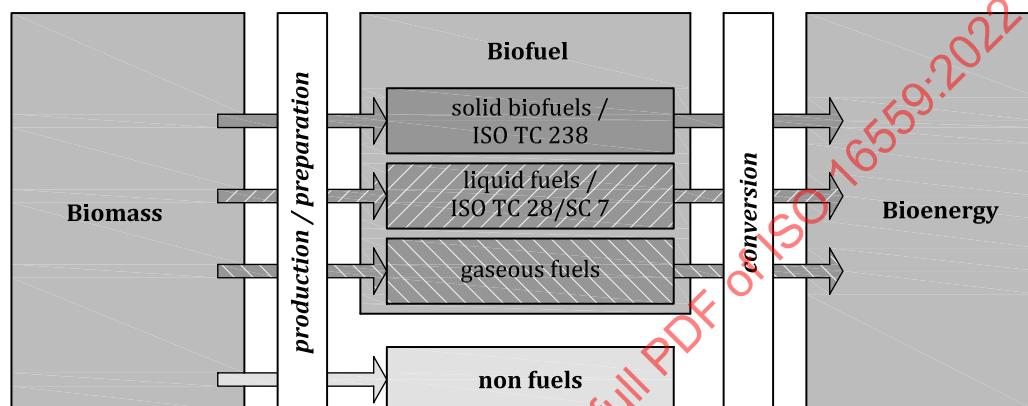


Figure 1 — ISO/TC 238 within the biomass-biofuel-bioenergy field

Solid biofuels are produced from different sources. Terms and definitions are categorized 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 solid 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 should be defined and described together with the category source/origin, type and properties of solid biofuels. The inclusion of terms defined in this document is, in many cases, based on the detailed classification system of solid biofuels given in ISO 17225-1.

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Solid biofuels — Vocabulary

1 Scope

This document establishes a vocabulary for solid biofuels. This document only includes raw and processed material originating from

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

NOTE 1 Chemically treated material cannot include halogenated organic compounds or heavy metals at levels higher than those in typical virgin material values (see also ISO 17225-1:2021, Annex B) or higher than typical values of the country of origin.

NOTE 2 Raw and processed material includes woody, herbaceous, fruit and aquatic biomass and biodegradable waste originating from above sectors.

Materials originating from different recycling processes of end-of-life-products are outside the scope of this document but relevant terms are included for information. Liquid biofuels (ISO/TC 28/SC 7), natural gas (ISO/TC 193) and solid recovered fuels (ISO/TC 300) are outside the scope of this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

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 1 to entry: *Adsorption* (3.3) is a surface-based process while *absorption* involves the whole volume (3.214) of the material.

3.2

additive

material which has been intentionally introduced into the fuel *feedstock* (3.86) to improve *quality* (3.160) of *fuel* (3.99) (e.g. combustion or durability properties), to reduce emissions or to make production more efficient

Note 1 to entry: Trace amounts of, e.g. grease or other lubricants that are introduced into the *fuel* (3.99) processing stream as part of typical mill operations are not considered as additives.

[SOURCE: ISO 17225-2:2021, 3.1]

3.3

adsorption

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

3.4

agrofuel

biofuel (3.27) obtained from *energy crops* (3.76) and/or agricultural by-products (agricultural residues)

[SOURCE: FAO unified bioenergy terminology (UBET)]

3.5

air-dried

in a condition, in which the *solid biofuel* (3.185) has been brought to equilibrium *moisture content* (3.132) by drying in air

3.6

angle of drain

steepest angle of descent within a silo or a hopper when granular material on the slope face is on the verge of sliding

Note 1 to entry: The angle of drain is measured in degrees of slope relative to the horizontal plane.

Note 2 to entry: The angle of drain is typically a few degrees higher than the *angle of repose* (3.7).

3.7

angle of repose

critical angle of repose

steepest angle of descent of a stock pile when granular material on the slope face is on the verge of sliding

Note 1 to entry: The angle of repose is measured in degrees of the slope of material relative to the horizontal plane.

Note 2 to entry: The angle of repose is typically a few degrees lower than the *angle of drain* (3.6).

3.8

animal biomass

biomass (3.32) obtained from livestock

Note 1 to entry: Animal biomass is not a *solid biofuel* (3.185). The term is included for information only.

3.9

animal by-products

animal residues

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

Note 1 to entry: It includes among others solid excreta of animals.

3.10

aquatic biomass

biomass (3.32) from hydrophytic plants or hydrophytes

Note 1 to entry: Hydrophytes are plants that have adapted to living in or on aquatic environments.

3.11
as determined
as analysed
ad

reference *moisture content* (3.132) of the material at the moment of analysis/determination

Note 1 to entry: "ad" is used as a subscript, e.g. M_{ad} is equivalent to *moisture content* (3.132) at the time of determination.

3.12
as received
as delivered
ar

calculation basis for a material in the delivery state

Note 1 to entry: The abbreviation of as received is "ar".

3.13
ash
ash content
total ash

A

mass of inorganic residue remaining after complete combustion of a *fuel* (3.99) under specified conditions, typically expressed as a percentage of the mass of *dry matter* (3.71) in *fuel* (3.99)

Note 1 to entry: See also *ash melting behaviour* (3.17).

Note 2 to entry: Depending on the combustion efficiency, the ash can contain combustibles.

Note 3 to entry: If a complete combustion is realised, ash contains only inorganic, non-combustible components.

3.14
ash deformation temperature
deformation temperature
DT

temperature at which first signs of melting occur

Note 1 to entry: See also *ash melting behaviour* (3.17).

Note 2 to entry: *Ash deformation temperature* can be seen as rounding of the edges, smoothing of surfaces, expansion of the cylinder or general changing of the cylinder shape. If the test piece starts to swell or bubble without the edges being rounded, the temperature is registered as *DT* (since swelling and bubbling only occur when a fraction of the *ash* (3.13) is melted).

[SOURCE: ISO 21404:2020, 3.2, modified — First preferred term added, Notes 1 and 3 to entry deleted, new Note 1 to entry added.]

3.15
ash flow temperature
flow temperature
FT

temperature at which the *ash* (3.13) 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* (3.16)

Note 1 to entry: See also *ash melting behaviour* (3.17).

3.16

ash hemisphere temperature
hemisphere temperature

HT

temperature at which the test piece forms approximately a hemisphere, i.e. when the height is half of the base diameter

Note 1 to entry: See also *ash melting behaviour* (3.17).

[SOURCE: ISO 21404:2020, 3.3, modified — First preferred term added, Note to entry added.]

3.17

ash melting behaviour
ash fusibility

characteristic set of temperatures at which the *ash* (3.13) undergoes certain physical stages of melting during heating under specific conditions

Note 1 to entry: *Ash melting behaviour* is determined under either oxidising or reducing conditions.

Note 2 to entry: See also *ash deformation temperature* (3.14), *ash flow temperature* (3.15), *ash hemisphere temperature* (3.16) and *ash shrinkage starting temperature* (3.18).

3.18

ash shrinkage starting temperature
shrinkage starting temperature

SST

temperature at which the area of a test piece falls below 95 % of the original test piece area under specific conditions due to shrinking of a test piece

Note 1 to entry: See also *ash melting behaviour* (3.17).

Note 2 to entry: Shrinkage can be due to liberation of carbon dioxide and volatile alkali compounds. It can also be due to sintering and may be a first sign of partial melting.

[SOURCE: ISO 21404:2020, 3.1, modified — First preferred term added, Note 1 to entry added.]

3.19

bag weight

weight of the *fuel* (3.99) including the bag

3.20

baled biofuel
bale

solid biofuel (3.185) which has been compressed and bound to keep its shape and *bulk density* (3.40)

EXAMPLE Straw bales, bales of *energy grass* (3.80), bales of *logging residues* (3.124).

3.21

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

3.22

basic density

ratio of the mass on *dry basis* (3.70) and the *solid volume* (3.187) *as received* (3.12)

3.23

bio-based

derived from *biomass* (3.32)

[SOURCE: EN 16575:2013, 2.1 modified — Notes to entry deleted.]

3.24**bio-based content**

fraction of a *fuel* (3.99) that is derived from *biomass* (3.32)

Note 1 to entry: Typically expressed as a percentage of the *total mass* (3.205) of the product.

[SOURCE: EN 16575:2013, 2.4, modified — "product" changed to "fuel" and Note 2 to entry deleted.]

3.25**bio-based product****bio-based industrial product****bioproduct**

product wholly or partly derived from *biomass* (3.32)

Note 1 to entry: The *bio-based product* is typically characterized by the *bio-based* (3.23) *carbon content* (3.202) or the *bio-based content* (3.24).

[SOURCE: EN 16575:2013, 2.5, modified — Two new preferred terms added; Note 1 to entry modified and Notes 2 and 3 to entry deleted.]

3.26**bioenergy**

energy derived from *biomass* (3.32)

3.27**biofuel**

solid, liquid or gaseous *fuel* (3.99) produced directly or indirectly from *biomass* (3.32)

3.28**biofuel blend**

biofuel resulting from intentionally mixing of different *biofuels* (3.27)

EXAMPLE Straw or *energy grass* (3.80) with wood, dried *biosludge* (3.37) with *bark* (3.21).

3.29**biofuel briquette**

densified biofuel (3.64) made with or without *additives* (3.2) in pre-determined geometric form with at least two dimensions (length, width, height) of more than 25 mm, produced by compressing *biomass* (3.32)

3.30**biofuel mixture**

biofuel (3.27) resulting from natural or unintentional mixing of different *biofuels* (3.27) and/or different types of *biomass* (3.32)

3.31**biofuel pellet**

densified biofuel (3.64) made with or without *additives* (3.2) usually with a cylindrical form, random length typically 5 mm to 40 mm and diameter up to 25 mm and broken ends, produced by compressing *biomass* (3.32)

Note 1 to entry: Usually the *biomass* (3.32) has been milled before densification.

Note 2 to entry: See also *non-woody pellet* (3.140) and *wood pellet* (3.224).

3.32**biomass**

material of biological origin excluding material embedded in geological formations and/or fossilized

EXAMPLE Including but not limited to *energy crops* (3.76), agricultural crops and trees, food, feed and fibre crop residues, aquatic plants, algae, forestry and wood residues, agricultural wastes, processing by-products and other non-fossil *organic matters* (3.143).

Note 1 to entry: See also *aquatic biomass* (3.10), *fruit biomass* (3.98), *herbaceous biomass* (3.110) and *woody biomass* (3.227).

3.33

biomass by-product

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

EXAMPLE Sawdust (3.176) when sawing timber.

3.34

biomass residue

biomass (3.32) from well-defined side-streams from forestry, agriculture, aquaculture and related industrial operations

EXAMPLE Olive press cake after pressing of oil, *logging residues* (3.124).

3.35

biomass resource owner

body or enterprise with the right to exploit the *biomass* (3.32) resources

Note 1 to entry: The biomass resource owner can be a land or forest owner, a company, etc.

3.36

biomethane

methane produced from *biomass* (3.32), e.g. *solid biofuels* (3.185)

Note 1 to entry: Biomethane is not a *solid biofuel* (3.185). The term is included for information only.

3.37

biosludge

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

Note 1 to entry: *Biosludge* must be treated for the transformation into solid *biomass* (3.32).

3.38

black liquor

fluid containing *lignin* (3.121) removed from the wood in the pulping process

Note 1 to entry: *Black liquor* also contains pulping chemicals.

Note 2 to entry: *Black liquor* is not a *solid biofuel* (3.185). The term is included for information only.

3.39

bridging

arching

tendency of *particles* (3.147) to form a stable arch across an opening which restricts flow

[SOURCE: ISO 21637:2020, 3.8, modified — "bridge" replaced by "arch".]

3.40

bulk density

BD

mass of a portion of a particulate matter divided by the *volume* (3.214) of the container which is filled by that portion under specific conditions

[SOURCE: ISO 21637:2020, 3.9, modified — abbreviation "BD" added, "solid fuel" replaced by "particulate matter", text in parentheses deleted.]

3.41**bulk permeability****permeability in storage**

ability of gas such as air to pass through the void spaces in *biomass* (3.32) during storage

Note 1 to entry: Permeability is measured in pressure (Pa) vs. flow of gas ($\text{m}^3/\text{s}/\text{m}^2$) and depends for example on the viscosity and *density* (3.65) of the gas (including *moisture content* (3.132) and temperature), shape, and orientation of *particles* (3.147) and the bulk porosity of *biomass* (3.32).

3.42**bundled biofuel****bundle**

solid biofuels (3.185) which have been bound together and where there is a lengthwise orientation of the material

EXAMPLE Bundles of *short rotation coppice* (3.178), *logging residues* (3.124) or small trees.

3.43**calorific value****heating value**

Q

energy amount per unit mass released on complete combustion

Note 1 to entry: *Q* is used as designation for the *net calorific value* (3.136) as received (3.12) basis at constant pressure ($q_{p,net,ar}$).

Note 2 to entry: See also *gross calorific value* (3.106), *energy density* (3.77), *net calorific value* (3.136).

3.44**cereal crops**

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

EXAMPLE Barley, wheat, rye, oat.

Note 1 to entry: Some cereal crops can be used as a *solid biofuel* (3.185).

3.45**certified reference material****CRM**

reference material (3.164) of which one or more property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body

3.46**charcoal****biochar****biocarbon****biocoke****biocoal**

solid biofuel (3.185) derived from carbonization, distillation or *pyrolysis* of *biomass* (3.32)

[SOURCE: ANSI/ASABE S593]

3.47**chemical treatment**

any treatment with chemicals other than air, water or heat

[SOURCE: ISO 17225-1:2021, 3.1, modified — Note 1 to entry deleted.]

3.48**chopped straw**

straw which has been cut into small pieces

3.49

chunkwood

wood cut with sharp cutting devices where most of the material have typical *particle* (3.147) lengths of 50 mm to 150 mm

Note 1 to entry: *Chunkwood* is substantially longer and coarser than *wood chips* (3.222).

3.50

coarse pellet fines

CPF

particles (3.147) with a size ranging from $\geq 3,15$ mm to $< 5,6$ mm resulting from breakage of pellets during production or handling

Note 1 to entry: The fraction of coarse pellet fines contains all *particles* (3.147) which pass through a sieve with an aperture size of 5,6 mm round hole and which are retained on a sieve with an aperture size of 3,15 mm round hole.

3.51

coke

solid residue of impure carbon obtained from carbon rich *feedstock* (3.86) after removal of volatile material by destructive distillation

[SOURCE: ANSI/ASABE S593]

3.52

combined sample

composite sample

sample (3.168) consisting of all the *increments* (3.118) taken from a *lot* (3.126) or a *sub-lot* (3.193)

Note 1 to entry: The *increments* (3.118) may be reduced by division before being added to the *combined sample*.

Note 2 to entry: See also [Annex A](#).

3.53

complete tree

tree, including branches and root system

Note 1 to entry: See also *whole tree* (3.218).

3.54

contamination

occurrence of any undesirable matter such as chemical, physical and/or microbiological matter in the product

[SOURCE: ISO 22716:2007, 2.10]

3.55

co-product

any of two or more products coming from the same unit process or product system

[SOURCE: ISO 14040:2006, 3.10]

3.56

critical control point

CCP

quality control (3.162) point within or between processes at which relevant properties can be most readily assessed and which offer the greatest potential for *quality* (3.160) improvement

3.57

cross-cut ends

short pieces of *woody biomass* (3.227) which occur when the ends of logs or sawn timber are cross cut off, with or without *bark* (3.21)

3.58**cutter chips**

wood chips (3.222) made as a by-product of the wood processing industry, with or without *bark* (3.21)

3.59**deflagration**

violent event describing subsonic combustion propagating by means of hot burning material [usually *dust* (3.73)] heating the next layer of cold material and igniting it in consecutive sequence

Note 1 to entry: The process can be characterized as an exploding fire whereby the burning material partly deposits on surfaces in its path and causing significant damage and injuries.

[SOURCE: EN 13857-1:2003, 2.13, modified — With regard to solid biofuels.]

3.60**deflagration index**

measure in bar meter per second and is a product of the pressure rate and propagation of an *explosion* (3.83) as established by testing standards

3.61**delivery agreement**

contract for *fuel* (3.99) trade, which specifies, e.g. origin and source, *quality* (3.160) and quantity of the *fuel* (3.99), as well as delivery terms

3.62**delivery lot**

amount of a *solid biofuel* (3.185) delivery to which the essential *quality* (3.160) requirements are related

Note 1 to entry: The *delivery lot* can be an individual *delivery lot*, which is an agreed quantity of *solid biofuel* (3.185) (e.g. a package, shipload or truck load), or continuous delivery, where several loads are delivered to the *end-user* (3.75) during an agreed period of time (usually daily or weekly delivery).

Note 2 to entry: In continuous delivery, the *delivery lot* is the amount of *solid biofuel* (3.185) delivered during a specified period of time, e.g. 24 h, unless otherwise agreed by *supplier* (3.195) and *end-user* (3.75). If the *delivery lot* in continuous delivery is more than 1 500 to 2 000 m³ in 24 h, it should be divided into two or more individual *lots* (3.126).

3.63**demolition wood**

used wood (3.212) arising from demolition of buildings or civil engineering installations

3.64**densified biofuel
compressed biofuel**

solid biofuel (3.185) made by mechanically compressing *biomass* (3.32) or *thermally treated biomass* (3.200) to mould the *solid biofuel* (3.185) into a specific size and shape such as cubes, pressed logs, *biofuel pellets* (3.31) or *biofuel briquettes* (3.29)

3.65**density**

ratio of mass to *volume* (3.214) or ratio of energy content to *volume* (3.214)

Note 1 to entry: It shall always be stated whether the density refers to the density of individual *particles* (3.147) or to the *bulk density* (3.40) of the material and whether the mass of water in the material is included.

Note 2 to entry: See also *particle density* (3.148) and *energy density* (3.77).

3.66**desorption**

phenomenon whereby a substance is released from or through a surface

Note 1 to entry: The process is the opposite of *absorption* (3.1) and *adsorption* (3.3).

3.67

detonation

violent event generated by sudden expansion of gas in to a supersonic shock wave (molecular speed higher than the speed of sound) not followed by fire

3.68

devolatilization

process (usually pyrolysis or gasification) whereby *volatile matter* (3.213) is removed from carbon rich *feedstock* (3.86) [e.g. *biomass* (3.32)]

[SOURCE: ANSI/ASABE S593]

3.69

dry ash free

dry ash free basis

daf

calculation basis in which the *solid biofuel* (3.185) is considered free from *moisture* (3.132) and *inorganic matter* (3.119)

3.70

dry

dry basis

d

calculation basis in which the *solid biofuel* (3.185) is considered free from *moisture* (3.132)

3.71

dry matter

material remaining after removal of *moisture* (3.132) under specific conditions

3.72

dry matter content

portion of *dry matter* (3.71) in the total material on mass basis

Note 1 to entry: Expressed as a percentage of the *total mass* (3.205) of the *solid biofuel* (3.185).

3.73

dust

fragmented material of small size passing a 500 µm sieve caused by a non-intentional process

Note 1 to entry: It is opposed to *fuel powder* (3.101) which is intentionally manufactured to size.

3.74

edgings

parts of *woody biomass* (3.227) which occur when trimming sawn timber and which show a remainder of the original rounded surface of the tree, with or without *bark* (3.21)

3.75

end-user

consumer (private person, enterprise, utility etc.) using *biofuel* (3.27)

3.76

energy crops

woody or herbaceous crops grown and harvested specifically for their *fuel* (3.99) value

Note 1 to entry: See also *energy forest trees* (3.78), *energy grass* (3.80).

3.77**energy density***E*ratio of net energy content and *bulk volume* (3.125)

Note 1 to entry: The *energy density* is calculated using the *net calorific value* (3.136) determined and the *bulk density* (3.40).

3.78**energy forest trees***woody biomass* (3.227) grown specifically for its *fuel* (3.99) value in medium to long rotation forestry**3.79****energy grain**

grain used for energy purpose

3.80**energy grass**herbaceous *energy crop* (3.76)

EXAMPLE Sugarcane, Miscanthus, Reed canary grass.

3.81**energy wood****fuelwood***wood fuel* (3.223) where the original composition of the wood is maintained and which has only been threated mechanically**3.82****explosibility**

propensity by gaseous, liquid or solid material to ignite and violently transform to high pressure gas while emitting sound and light, and typically followed by fire

3.83**explosion**

violent event emitting sound, and light typically followed by fire

Note 1 to entry: An initial explosion, often referred to as primary explosion, can dislodge *dust* (3.73) deposited on beams, floor, machinery etc. and ignite this material resulting in a secondary explosion, usually a few seconds after the first explosion.

Note 2 to entry: Thermal energy is transferred from the first to the second explosion through *deflagration* (3.59).

[SOURCE: EN 16256-1:2012, 2.9, modified — Notes to entry added.]

3.84**extraneous ash***ash* (3.13) from contaminants entering the material at harvest, logging, treatment, transport, storage, etc.**3.85****extraneous material****foreign matter***non-biomass* (3.32) material, which has entered the *fuel* (3.99)

Note 1 to entry: See also *impurity* (3.117) and *heavy extraneous material* (3.109).

EXAMPLE Plastic, metal or stone.

3.86

feedstock

material that is further processed for conversion to *bioenergy* (3.26), *biofuel* (3.27) and/or *bio-based products* (3.25)

3.87

fibre saturation point

FSP

moisture content (3.132) of woody material at which only the cell walls are completely saturated (all bound water) but no free water exists in the cell lumens – typically about 27 % *total moisture* (3.206) [wet basis (3.217)]

Note 1 to entry: Below the *fibre saturation point* the physical and mechanical properties of wood begin to change as a function of *moisture content* (3.132).

3.88

fibre sludge

sludge formed in the sedimentation basin as a part of the waste water treatment process in a pulp and paper mill and separated by sedimentation or flotation

Note 1 to entry: The main component is pieces of wood fibres. The sludge can be dewatered and further processed into a *solid biofuel* (3.185).

3.89

fines

F

fraction of small sized *particles* (3.147) as defined by a specification or user

Note 1 to entry: In the *solid biofuels* (3.185) standards fines are always defined as *particles* (3.147) passing a 3,15 mm round hole sieve.

3.90

firewood

cut and split oven-ready *energy wood* (3.81) usually used in household wood burning appliances like stoves, fireplaces and central heating systems

Note 1 to entry: Firewood usually has a uniform length, typically in the range of 15 cm to 100 cm.

Note 2 to entry: Cut-offs from virgin wood can also be used as a firewood.

3.91

fixed carbon

remaining carbon calculated by subtracting *total moisture* (3.206), *ash* (3.13) and *volatile matter* (3.213) from 100 %

Note 1 to entry: The fixed carbon fraction can contain traces of other elements, such as hydrogen or oxygen.

Note 2 to entry: All percentages (% in mass) are on same *moisture* (3.132) basis (see also ISO 17225-1).

3.92

flash point

temperature at which the vapor of a material will ignite when exposed to an ignition source

3.93

flammability

propensity by gaseous, liquid or solid material to catch fire upon exposure to an ignition source

3.94

flowability

ability of a solid bulk material to flow

Note 1 to entry: See also *bridging* (3.39).

3.95**forest chips**

forest wood in the form of *wood chips* (3.222)

3.96**forest fuels**

biofuel (3.27), which is produced directly from forest wood or plantation wood by a mechanical process, the raw material has not previously had another use

3.97**forest, plantation and other virgin wood**

wood from forest, plantation and other virgin wood including segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater

Note 1 to entry: See also *complete tree* (3.53), *energy forest trees* (3.78), *logging residues* (3.124), *stump* (3.192), *tree section* (3.210) and *whole tree* (3.218).

3.98**fruit biomass**

part of a plant which holds seeds

EXAMPLE Nuts, olives, oil palm fruit.

3.99**fuel**

energy carrier intended for energy conversion

3.100**fuel classification**

division of *fuels* (3.99) into defined *fuel* (3.99) classes

Note 1 to entry: The aim of classification can be to describe the fuel and/or to physically separate certain traded form.

3.101**fuel powder****fuel flour**

pulverised fuel (3.159) intentionally manufactured to size less than 1 mm

EXAMPLE Wood powder, wood flour, straw powder.

3.102**fuel specification**

description of origin and source, *fuel* (3.99) traded form and *fuel* (3.99) properties

3.103**general analysis sample**

sub-sample (3.194) of a *laboratory sample* (3.120) having a *nominal top size* (3.137) of 1 mm or less and used for a number of chemical and physical analyses

Note 1 to entry: See also [Annex A](#).

3.104**green biomass**

material with a *moisture content* (3.132) close to fresh after harvesting

3.105**green chips****fresh chips**

wood chips (3.222) produced from recently harvested *woody biomass* (3.227)

3.106

**gross calorific value
higher heating value**

$q_{V,gr}$

measured value of specific energy of combustion of a solid *fuel* (3.99) burned in oxygen in a calorimetric bomb under such conditions that all the water of the reaction products is in the form of liquid water

Note 1 to entry: The result of combustion is assumed to consist of gaseous, oxygen, nitrogen, carbon dioxide and sulfur dioxide, of liquid water (in equilibrium with its vapor) saturated with carbon dioxide under conditions of the bomb reaction, and of solid *ash* (3.13), all at the reference temperature and at constant *volume* (3.214).

3.107

gross density

ratio of the mass of a wooden body and its *volume* (3.214), including all cavities (pores and vessels), based on specific *moisture content* (3.132)

Note 1 to entry: See also *particle density* (3.148).

3.108

heat rate

measure of the number of heating units required to generate output energy over a length of time expressed in megawatt-hours (MWh)

Note 1 to entry: MWh is used to express thermal efficiency of thermal conversion facilities such as power plants.

3.109

heavy extraneous materials

extraneous substances $\geq 3,15$ mm with a specific *density* (3.65) > 1 g/cm³

Note 1 to entry: Most of the *particles* (3.147) are inorganic material, e.g. stones, glass or metal, but it also can include *particles* (3.147) of organic but not biogenic origin, e.g. plastic or rubber.

3.110

herbaceous biomass

biomass (3.32) from plants that have a non-woody stem and which die back at the end of the growing season

Note 1 to entry: See also *energy grass* (3.89).

[SOURCE: BioTech's Life Science Dictionary]

3.111

herbaceous fuel

biofuel (3.27) originating from *herbaceous biomass* (3.110)

3.112

**hog fuel
shred**

wood fuel (3.223) that has pieces of varying size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails

3.113

hydrophilic

having the propensity to attract water

3.114

hydrophobic

having the propensity to repel water

3.115**hydrothermally carbonized biomass**

solid biofuel (3.185) produced by thermo-chemical conversion process of *biomass* (3.32) performed in pressurized hot (liquid) water, typically at temperatures between 160 °C to 250 °C and at pressures between 6 bar to 40 bar

3.116**hygroscopic**

having the propensity to adsorb or absorb *moisture* (3.132) from the air

3.117**impurity**

material other than claimed, which has entered the *fuel* (3.99)

EXAMPLE Stones, soil, pieces of metal, plastics, rope, ice and snow.

3.118**increment**

portion of *fuel* (3.99) extracted in a single operation of the *sampling* (3.171) device

Note 1 to entry: See also [Annex A](#).

3.119**inorganic matter**

non-combustible fraction of a *fuel* (3.99)

3.120**laboratory sample**

sample (3.168) delivered to a laboratory

Note 1 to entry: See also [Annex A](#).

3.121**lignin**

class of complex, aromatic, highly cross-linked, and amorphous macromolecules that play a key role in the formation of cell walls in wood and *bark* (3.21), conferring mechanical strength and rigidity to the cell walls and to plants as a whole

3.122**lignocellulose**

plant cell wall *biomass* (3.32) composed primarily of cellulose, hemicelluloses and *lignin* (3.121)

[SOURCE: ANSI/ASABE S593]

3.123**log wood**

cut *energy wood* (3.81) in which most of the material has a length of 500 mm and above

3.124**logging residues**

woody biomass (3.227) residues created during wood harvesting

Note 1 to entry: Logging residues include branches and tree tops that can be salvaged when fresh or after seasoning.

3.125**loose volume****bulk volume**

volume (3.214) of a material including space between the *particles* (3.147)

3.126

lot

defined quantity of *fuel* (3.99) for which the *quality* (3.160) will be determined

Note 1 to entry: See also *sub-lot* (3.193).

Note 2 to entry: See also [Annex A](#).

3.127

major elements

elements in the *fuel* (3.99) that predominantly will constitute the *ash* (3.13)

Note 1 to entry: Major elements include aluminium (Al), calcium (Ca), iron (Fe), magnesium (Mg), phosphorus (P), potassium (K), silicon (Si), sodium (Na) and titanium (Ti).

3.128

mass-reduction

reduction of the mass of a *sample* (3.168) or *sub-sample* (3.194)

3.129

mechanical durability

DU

ability of densified fuel units (e.g. briquettes, pellets) to remain intact during handling and transportation

3.130

median value of a particle size distribution

d₅₀

calculated *particle size* (3.149) of a *sample* (3.168) where 50 % of the *particle* (3.147) mass is below and 50 % is above

3.131

minor elements

elements in the *fuel* (3.99) that are at small concentrations

Note 1 to entry: "Trace elements" is often used synonymous to *minor elements*; if the elements are metal, the term trace metals also is used.

Note 2 to entry: Concerning *solid biofuels* (3.185), minor elements include, but not limited to elements (not all are metals) such as arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), mercury (Hg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), antimony (Sb), selenium (Se), tin (Sn), thallium (Tl), vanadium (V) and zinc (Zn).

3.132

moisture

moisture content

M

amount of water in the *fuel* (3.99) with reference to *wet basis* (3.217)

Note 1 to entry: See also *total moisture* (3.206), *as received* (3.12) and *as determined* (3.11).

3.133

moisture analysis sample

sample (3.168) taken specifically for the purpose of determining *total moisture* (3.206)

3.134**moisture at dry basis***U*

moisture content (3.132) at *dry basis* (3.70) amount of water in the *fuel* (3.99) with reference to *dry basis* (3.70)

Note 1 to entry: This term is used in various industries. In *solid biofuels* (3.185) *moisture* (3.132) with reference to *wet basis* (3.217) is used.

3.135**municipal solid waste****MSW**

waste stream consisting of end-of-life-materials

Note 1 to entry: Municipal solid waste can contain *biomass* (3.32) fractions as well as non-*biomass* (3.32) fractions.

Note 2 to entry: Only separated and not contaminated *biomass* (3.32) fractions could be *solid biofuels* (3.185), see also *solid recovered fuels* (3.186).

Note 3 to entry: The term is included for information only.

3.136**net calorific value****lower heating value** $q_{p,net}$

calculated value of specific energy of combustion of a *solid fuel* (3.99) burned in oxygen under such conditions that all the water of the reaction products remain as water vapour

Note 1 to entry: The net calorific value is calculated from the *gross calorific value* (3.106) at either constant pressure or at constant *volume* (3.214). The net calorific value at constant pressure is however the one generally used.

Note 2 to entry: For the use of the designation *Q*, see also *calorific value* (3.43).

3.137**nominal top size**

smallest aperture size of the sieve through which at least 95 % by mass of the material passes during the determination of *particle size distribution* (3.150)

Note 1 to entry: For selection of sieves types and aperture sizes see ISO 17827-1 and ISO 17827-2.

3.138**non-woody biomass**

biomass (3.32) originating from *herbaceous*, *fruit* or *aquatic biomass* (3.10) as well as their blends or mixtures with *woody biomass* (3.227)

3.139**non-woody briquette**

biofuel briquette (3.29) made from *non-woody biomass* (3.138)

Note 1 to entry: The raw material for non-woody briquettes can be *herbaceous*, *fruit*, *aquatic biomass* (3.10) or *biomass* (3.32) blends and mixtures according to ISO 17225-1:2021, Table 1.

3.140**non-woody pellet**

biofuel pellet (3.31) made from *non-woody biomass* (3.138)

Note 1 to entry: The raw material for non-woody pellets can be *herbaceous*, *fruit*, *aquatic biomass* (3.10) or *biomass* (3.32) blends and mixtures according to ISO 17225-1:2021, Table 1.

3.141

off-gassing

spontaneous emission of condensable (e.g. terpenes) and non-condensable gases (e.g. carbon-monoxide, carbon-dioxide, methane) from *biomass* (3.32)

3.142

operator

body or enterprise, which is responsible for one or several activities in the *fuel* (3.99) *supply chain* (3.196)

Note 1 to entry: The first *operator* is a body or an enterprise which operates at the beginning of the *supply chain* (3.196).

EXAMPLE The *operator* can be, for example, a *biofuel producer* (3.156) or a subcontractor to the *biofuel supplier* (3.195).

3.143

organic matter

combustible fraction of the *biofuel* (3.27)

3.144

oscillating screen classifier

device containing one or multiple oscillating (flat) screens used to separate material into size classes for determination of *particle size distribution* (3.150)

3.145

oven dry matter

biomass (3.32) free of *moisture* (3.132), produced by drying to constant weight under specific conditions

3.146

oversized particle

particle (3.147) which exceeds a specific *particle size* (3.149) limit value or values

Note 1 to entry: Limit values may be given in three dimensions.

3.147

particle

discrete unit of matter

3.148

particle density

DE

density (3.65) of a single *particle* (3.147), where the pores within the *particle* (3.147) are included

3.149

particle size

size of a single *particle* (3.147) as determined (3.11)

Note 1 to entry: See also *particle size distribution* (3.150) and *fines* (3.89).

3.150

particle size distribution

P

proportions of various *particle sizes* (3.149) in a solid *fuel* (3.99)

Note 1 to entry: Different methods of determination can give different results.

3.151

particle size reduction

reduction of the *nominal top size* (3.137) of a *sample* (3.168) or *sub-sample* (3.194)

[SOURCE: EN 15443:2011, 3.8]

3.152**peat**

sedentarily accumulated material consisting partly of dead organic material

Note 1 to entry: The term is included for information only.

3.153**point of delivery**

location specified in the *delivery agreement* (3.61), at which the proprietary rights of and responsibilities for a *fuel* (3.99) *lot* (3.126) are transferred from one organization or unit to another

3.154**pressing aid**

additive (3.2) used for enhancing the production of densified fuels

3.155**primary biomass**

biomass (3.32) produced directly by photosynthesis and harvested or collected from the field or forest where it is grown

EXAMPLE *Energy grain* (3.79), perennial grasses and wood crops, crop residues and logging residues (3.124).

[SOURCE: ANSI/ASABE S593]

3.156**producer**

organization or unit responsible for the production of the *fuel* (3.99)

Note 1 to entry: The producer can be responsible for any operation with the purpose of changing the biofuel properties.

Note 2 to entry: The producer can also be the *supplier* (3.195) of the *fuel* (3.99).

3.157**product declaration**

document dated and signed by the *producer* (3.156)/*supplier* (3.195) to the *retailer* (3.167) or *end-user* (3.75), specifying origin and source, traded form and properties of defined *lot* (3.126), delivery period or *delivery agreement* (3.61)

3.158**proximate analysis**

analysis of a solid *fuel* (3.99) reported in terms of *moisture* (3.132), *volatile matter* (3.213), *ash* (3.13) and *fixed carbon* (3.91)

[SOURCE: ISO 1213-2:2016, 3.169, modified — “mineral fuel” replaced with “solid fuel”.]

3.159**pulverized fuel****grinded fuel**

solid *fuel* (3.99) in the form of *dust* (3.73) and powder, produced by milling or grinding

Note 1 to entry: See also *fuel powder* (3.101).

3.160**quality**

degree to which a set of inherent characteristics fulfils requirements

[SOURCE: ISO 9000:2015, 3.2.6, modified — “of an object” deleted and notes to entry deleted.]

3.161

quality assurance

part of *quality* (3.160) management focused on providing confidence that the *quality* (3.160) requirements will be fulfilled

[SOURCE: ISO 9000:2015, 3.3.6]

3.162

quality control

part of *quality* (3.160) management focused on fulfilling *quality* (3.160) requirements

[SOURCE: ISO 9000:2015, 3.3.7]

3.163

recovered construction wood

used wood (3.212) arising from construction of buildings or from civil engineering works

3.164

reference material

RM

material or substance, of which one or more property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials

[SOURCE: EN 15297:2011, 3.1]

3.165

repeatability

precision from independent test results when the same method was used in the same laboratory on representative portions taken from the same *test sample* (3.199) material

3.166

reproducibility

precision from test results when the same method was used by different laboratories by different *operators* (3.142) using different equipment on representative portions taken from the same *test sample* (3.199) material

3.167

retailer

supplier (3.195) of *fuels* (3.99) (usually packaged in small quantities) to *end-user* (3.75)

Note 1 to entry: *Retailers* are usually *suppliers* (3.195) to the private household consumers.

3.168

sample

quantity of material [all *increments* (3.118)], representative of a larger quantity for which the *quality* (3.160) will be determined

Note 1 to entry: See also *combined sample* (3.52), *general analysis sample* (3.103), *increment* (3.118), *laboratory sample* (3.120), *moisture analysis sample* (3.133), *size analysis sample* (3.181) and *sub-sample* (3.194).

3.169

sample division

division of a *sample* (3.168) or *sub-sample* (3.194) to an appropriate size which typically leads to a mass reduction of a *sample* (3.168) or *sub-sample* (3.194)

3.170

sample preparation

actions taken to obtain representative *laboratory samples* (3.120) or *test portions* (3.198) from the original *sample* (3.168)

3.171**sampling**

process of drawing or constituting a *sample* (3.168)

Note 1 to entry: See [Annex A](#) for a descriptive figure of the hierarchy in sampling.

3.172**sampling form**

document used during *sampling* (3.171) to record data about the way in which the *sampling* (3.171) is actually being carried out

3.173**sampling plan**

predetermined procedure for the selection, withdrawal, preservation, transportation, and preparation of the portions removed from a population as a *sample* (3.168)

3.174**sampling certificate**

report which serves as a check list and provides the investigator with all necessary information about the *sampling* (3.171) techniques applied at the site and any additional important information

3.175**sander dust****sanding dust****grinding dust**

dust-like wood residue formed when smoothing wood surfaces

3.176**sawdust**

fine *particles* (3.147) created when sawing wood, in which most of the material has a typical *particle* (3.147) length of 1 mm to 5 mm

3.177**secondary biomass**

residues and by-product streams from food, feed, fibre, wood and materials processing plants [such as *sawdust* (3.176), *black liquor* (3.38) and cheese whey], and manures from animal feeding operations

[SOURCE: ANSI/ASABE S593]

3.178**short rotation coppice****SR**

production of *woody biomass* (3.227), generally on agricultural lands, by regenerating new stems (shoots) from the (stool) *stump* (3.192) or roots and relying on rapid growth, (harvested) generally over a 1-year to 8-year cycle

3.179**short rotation forestry**

production of trees (generally) on forest land, that rely on rapid growth of individuals harvested in short cycles (of 5 years to 15 years)

3.180**shredded biofuel**

solid biofuel (3.185) which has been mechanical treated into smaller *particles* (3.147) with blunt tools

EXAMPLE *Chopped straw* (3.48), *shredded bark* (3.21), *wood and hog fuel* (3.112).

3.181**size analysis sample**

sample (3.168) taken specifically for the purpose of determining *particle size distribution* (3.150)

3.182

slab

piece initially sawn from the length of a log when squaring up the log, with or without *bark* (3.21)

3.183

slag

biofuel (3.27) derived *ash* (3.13) that is or has been in a molten (or liquid) state

[SOURCE: ANSI/ASABE S593]

3.184

smallwood

energy wood (3.81) cut with sharp cutting devices and in which most of the material has a *particle* (3.147) length typically 50 mm to 500 mm

EXAMPLE *Chunkwood* (3.49), *firewood* (3.90).

3.185

solid biofuel

solid *fuel* (3.99) produced directly or indirectly from *biomass* (3.32)

3.186

solid recovered fuel

solid *fuel* (3.99) prepared from non-hazardous waste utilized for energy recovery in incineration or co-incineration plants

3.187

solid volume

volume (3.214) of a mass of *particles* (3.147) excluding the *volume* (3.214) of the void spaces between the *particles* (3.147)

Note 1 to entry: Typically determined by a fluid displaced by a specific amount of material.

3.188

soot

fine black *particles* (3.147), chiefly composed of carbon, produced by incomplete combustion of carbon rich *feedstock* (3.86)

[SOURCE: ANSI/ASABE S593]

3.189

stacked volume

volume (3.214) of stacked material including the space between the material pieces

3.190

stem wood

roundwood

part of tree stem with the branches and top removed, with a length of more than 100 cm

3.191

stem wood chips

wood chips (3.222) made of *stem wood* (3.190) with or without *bark* (3.21)

3.192

stump

part of the tree stem below the felling cut, including the roots

3.193

sub-lot

portion of a *lot* (3.126) for which a test result is required

Note 1 to entry: See also [Annex A](#).