IBTC

International Biomass Torrefaction and Carbonisation Council

Biocarbon Terminology Version 3

Shaping the Future of Circular Biocarbon.

Together.

The IBTC defines itself as an industrial trade association with international outreach in the sector of thermally upgraded biomass. All elements of the value chain are covered, without any geographical or application-specific limitations.

“We work in all realms that can lead to an increased sustainable use of carbonized biomass and that are not subject to competition between our members. Market promotion, standardization of products, master-permits in logistics, bridging science and industry, administrative framework and integration into national and supranational legislation are just some of our ever-expanding activities.“

Michael Wild, President

Our mission is to accelerate the global adoption of biomass converted into high-value circular biocarbon through advanced thermal treatment.

From specialty to commodity

We aim to position circular biocarbon as a key sustainable commodity by enhancing technology, optimizing value chains, and influencing policies, trade, and consumption. Our focus is on driving emissions reduction by replacing fossil carbon, enabling diverse energy and industrial applications, and supporting carbon sequestration efforts. Through collaboration with all stakeholders, we are committed to building a robust and sustainable biocarbon market that contributes to a cleaner, more resilient future.

IBTC

We believe in the future of Circular Biocarbon

Torrefaction, pyrolysis, carbonisation, and steam explosion are thermal treatments that convert biomass into sustainable carbon substitutes. The solid outputs have diverse industrial applications, while the gases serve as energy sources or chemical precursors.

IBTC believes that torrefied or carbonised, sustainably sourced biomass can effectively replace fossil carbon across industries and applications. Additionally, the permanent sequestration of atmospheric carbon into soils will be crucial for driving the global shift toward a carbon-neutral economy and reducing atmospheric CO_2.

Membership

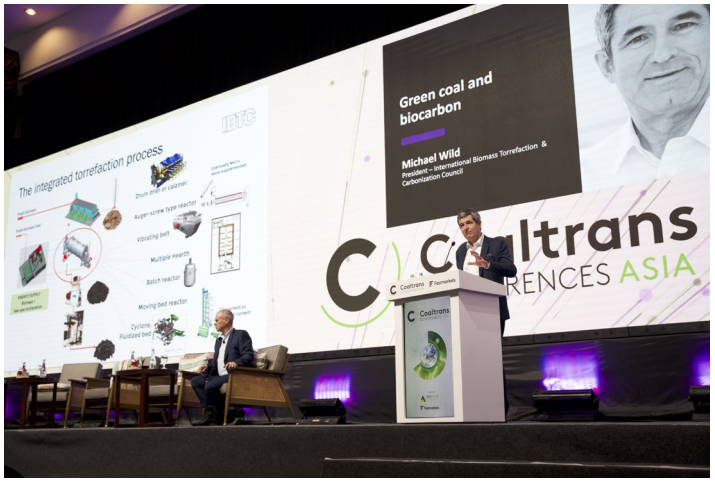
→ Reinforce with members
→ New “consuming”members
→ Additional “producing” members
→ SE & HTC members
→ Traders

Market Information Turntable

→ First contact point for anybody interested
→ Informing members on possible business opportunities
→ Presenting IBTC members to interested parties
→ Strengthening the collaboration with sectors besides power
→ Initiating regional/local/sectorial subgroups

Statistics Market Analytics

→ Data collection from members (plants and production)
→ Sectorial market research
→ Raw material assessments
→ Market monitors (CO_2, WWP, Coal etc)



IBTC

Promotion

→ Publications, Articles, Essays
→ Newsletter
→ Targeted application promotion
→ Conferences, Workshops, Seminars

Communication

→ Member‘s portfolio presentation
→ Organization and participation in workshops & webinars
→ Monthly updates to members
→ Database establishment
→ Communication & collaboration with other associations

Trade Services

→ Trade documents
→ Arbitration services for members
→ Umpire laboratory
→ Expert assessors

Internal Services and Exchange

→ Health & Safety production
→ Health & Safety logistics
→ Sector strategies
→ Roundtables and working groups
→ Databases and members library
→ Science link

Regulation

→ Monitor relevant policies (EU and beyond)
→ Involvement in key regulatory matters
→ Reporting to members
→ Sustainability

Biocarbon Terminology

In the past few years, we noticed quite a confusion and misapprehension concerning the process and products in thermal upgrading of biomass and do want to offer a first attempt to provide a comprehensive list of definitions and delimitations synthesizing what we see as current understanding in the market. The glossray will be updated regularly.

Register here for updates:

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). Absorption involves the whole volume of the material while Adsorption is a surface-based process.

Activated Biocarbon Biocarbon that has undergone further activation to increase the porosity of the material. This activation could be helped with chemicals. Owing to the large surface area and easy surface modification, activated biocarbon is widely applied as adsorbent for diverse chemicals, detoxification purposes or surface substrate.

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

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. Adsorption is a surface-based process while Absorption involves the whole volume of the material.

Agglomeration Mechanical compression of raw biomass or thermally treated biomass particles to mold the solid particles into a specific size and shape such as cubes, pressed logs, pellets or briquettes. Other expressions are Densification, Compression or Compacting.

Angle of repose / critical angle of repose Steepest angle of descent of a stockpile when granular material on the slope face is on the verge of sliding. The angle of repose is measured in degrees of the slope of material relative to the horizontal plane.

As determined / as analysed / ad Reference moisture content of the material at the moment of analysis/determination. “ad” is used as a subscript, e.g. Mad, indicating the moisture content at the time of determination.

As received / as delivered / ar Calculation basis for a material in the delivery state. The abbreviation of as received is “ar”, used as a subscript.

Ash Mass of inorganic residue remaining after complete combustion of a combustible substance under specified conditions, typically expressed as a percentage of the mass of dry matter in the substance or in g/kg.

Ash flow temperature / 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.

Ash fusion temperature

The ash fusion temperature of biomass refers to the temperature range at which the ash produced by the combustion of biomass undergoes fusion and, when cooled, becomes a solid, cohesive mass. This temperature range is important in determining the quality of thermally treated biomass and its suitability for different applications. The ash fusion temperature of a biomass is hardly influenced by thermal treatment of this material.

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.

Ash melting behaviour / ash fusibility

Characteristic set of temperatures at which the ash undergoes certain physical stages of melting during heating under specific conditions. Ash melting behaviour is determined under either oxidising or reducing conditions.

Autothermal

In connection with the thermal treatment of biomass, autothermal refers to thermal autonomy. The energy extracted from the raw biomass during the thermal treatment in the form of volatile gas is combusted to produce thermal energy to dry the raw biomass and heat it to the target value.

Batch process

A process in which all feed streams are introduced at the start of the process into the reactor. It could involve one or more process steps, and the final product is taken out of the reactor as the finished product. Batch processes can be operated individually or in series or parallel. Opposite: see continuous process.

Biochar

Biochar is a charcoal-like pyrogenic biocarbon produced to become a carbon-rich sequestration material. It is applied in such a way that the contained carbon remains stored as a long-term carbon sink. In some cases, it has additional impacts such as soil quality improvement.

Biocarbon/ Charcoal

Both terms refer to a product from thermal treatment of biomass with very low volatile matter remaining in the carbon-rich solid product. The term charcoal is often used for materials that are the result of traditional kiln processes in which the energy of the discharged gases is not used or is only used to a very limited extent. The production of biocarbon, on the other hand, is based on a process with optimized mass and energy balance and the minimization of all emissions (see Circular Biocarbon).

Biocoal

Biomass thermally treated to a mid-level of devolatilization. It resembles the typical characteristics of steam coal and hence is a drop-in substitute for thermal coal. Usually, it is produced in processes such as torrefaction, hydrothermal carbonization (HTC), steam explosion or pyrolysis. If the term that has no clear definition on product specifications will prevail is still to be seen.

Bioenergy

Bioenergy is renewable energy derived from biomass.

Biofuel

Solid, liquid or gaseous fuel produced directly or indirectly from biomass.

Biomass

Biomass is defined as organic material derived from plants and animals. Examples of biomass are woody biomass, multipurpose crops and dedicated biomass crops, and organic waste/ residues from industry, agriculture, forest and landscape management, and households. The biomass is converted to solid, liquid or gaseous matter that can serve as fuel or for other purposes.

Biomass feedstock The raw material that is processed for conversion into bioenergy-, biofuel- or any bio-based products.

Biomass residue Biomass from well-defined side-streams from forestry, agriculture, aquaculture and related industrial operations.

Biomethane Methane produced from biomass, e.g. solid biofuels.

Briquetting The briquetting process is an agglomeration process to compact loose biomass, biocoal, biocarbon or biochar particles into a homogeneous and densified product of pre-defined geometrical form with at least two dimensions >25 mm. Typically, this is done by press rollers or piston/screw presses compressing the material into different forms and shapes such as pillow or cylindrical. Briquetting is one of the many forms of agglomeration of biomass.

Bulk density / BD Mass of a portion of a particulate matter divided by the volume of the container which is filled by that portion under specific conditions.

Bulk permeability / permeability in storage Ability of gas such as air to pass through the void spaces in biomass during storage. Permeability is measured in pressure (Pa) vs. flow of gas ($m^3/s/m^2$) and depends for example on the viscosity and density of the gas (including moisture content and temperature), shape, and orientation of particles and the bulk porosity of biomass.

Carbon sequestration A natural or artificial process in which carbon dioxide is removed from the atmosphere and stored in solid or liquid form outside the atmosphere for a long period of time. Typical artificial methods of sequestration include the introduction of biochar (CO_2 absorbed by plants and bound in stable carbon) into the top layer of the earth's crust, carbon capture and storage (CCS), and bioenergy carbon capture and storage (BCCS).

Carbonisation Carbonisation is the process in which the carbon content of the raw biomass is concentrated by thermally treating the biomass in an oxygen-free environment at temperatures typically above 450°C. This process activates multiple chemical reactions achieving the removal of H and O atoms from the biomass, leaving behind almost pure carbon and minerals (ashes).

Chemical treatment Any treatment with chemicals other than air, water or heat.

Circular Biocarbon An umbrella term proposed by IBTC: Circular Biocarbon can be used as a generic term for all biomass-derived carbon products produced and utilized in a circular way from plant biomass. By the term may seem to be redundant at first glance, we propose the word “circular” not only to represent the carbon cycle that is closed in the short term when biomass is used, by absorbing the carbon released into the atmosphere by the next generation of plants through photosynthesis (dark reaction), but also to illustrate the clear focus to follow the principles of the circular economy. These include sustainable sourcing, sustainable and efficient processing, using all components of the resource, avoiding waste streams, with a focus on optimizing environmental, social, material and economic values achieved through the use of innovative practices and technologies.

Therefore the designation of a material as “Circular Biocarbon” is a clear extension of the term “pyrogenic biocarbon” used in the standards and confirms that this meets the compliance criteria of a regenerative circular economy.

Component compositions

Component composition is the breakdown of a product into its chemical or physical components, typically expressed as percentages by mass, volume, or molar ratio.

Continuous process

The term continuous process refers to a process in which feed and product streams enter and leave the process continuously, i.e. all the time. Opposite: see batch process.

Density

Ratio of mass to volume or ratio of energy content to volume. It shall always be stated whether the density refers to the density of individual particles or to the bulk density of the material and whether the mass of water in the material is included.

Depolymerisation and its stages

Depolymerisation of biomass in thermal decomposition refers to the breaking down of large, complex molecules (polymers) like cellulose, hemicellulose, and lignin into smaller molecules or monomers when heated. It can be divided into the following four consecutive phases:

1. Drying (up to ~120°C) - Water is removed (no chemical change yet).
2. Depolymerisation (~200–300°C) - Large biopolymers (cellulose, hemicellulose, lignin) begin to break into smaller molecules. No oxygen is involved (anaerobic). Products: small fragments like oligomers, volatile organics.
3. Cracking (~300–500°C) - Smaller molecules crack further into gases, light oils, and tars. Bonds continue to break; molecules rearrange.
4. Carbonization/Gasification (>500°C) - Final stage: formation of syngas (CO, H_2, CH_4), bio-oil, and solid char/carbon. Aromatic structures may form in the char.

Devolatilization

Heat applied on biomass will lead to chemical decomposition often summarized under the term devolatilization process as volatiles are released (gases and tars) from the organic part of solid biomass. It became popular to differentiate products of thermal treatment according to the level of devolatilization into low, medium or highly devolatilized products. Sometimes the term devolatilized is substituted by the term carbonized referring to the increasing content of fixed carbon in the related solid products. Typical low to mid products would also be called Torrefied Biomass or Biocoal. Highly carbonized products are also named Biocarbon or Biochar.

Dry ash free / dry ash free basis / daf

Calculation basis in which the solid biofuel is considered free from moisture and inorganic matter.

Dry / dry basis / db

Calculation basis in which the solid biofuel is considered free from moisture.

Dry torrefaction

Torrefaction carried out in a gaseous environment referring to degradation of biomass feedstock by means of heating under inert atmosphere (nitrogen) or oxidative atmosphere (air or flue gas).

Dust

Fragmented material of small size passing a 500 µm sieve caused by a non-intentional process. It is opposed to fuel powder which is intentionally manufactured to size.

Dust explosivity

A dust explosion is the rapid combustion of fine particles suspended in the air within an enclosed location. Dust explosions can occur where any dispersed powdered combustible material is present in high-enough concentrations in the atmosphere or other oxidizing gaseous medium, such as pure oxygen. Dust explosivity describes the potential for fine combustible dust particles, when suspended in air within specific concentration limits and an ignition source is present, to undergo a rapid combustion that produces an intense pressure wave and heat.

Energy density

Ratio of net energy content and bulk volume. The energy density is calculated using the net calorific value determined and the bulk density.

Extrusion

A process used to create objects of a fixed cross-sectional profile by pushing material of granular structure through a die of the desired cross-section. Thus, compacted material of different shapes with high material density can be achieved.

Fixed carbon

Remaining carbon calculated by subtracting total moisture, ash and volatile matter from 100% of the total mass analysed. The fixed carbon fraction can contain traces of other elements, such as hydrogen or oxygen.

Fischer–Tropsch process / FT

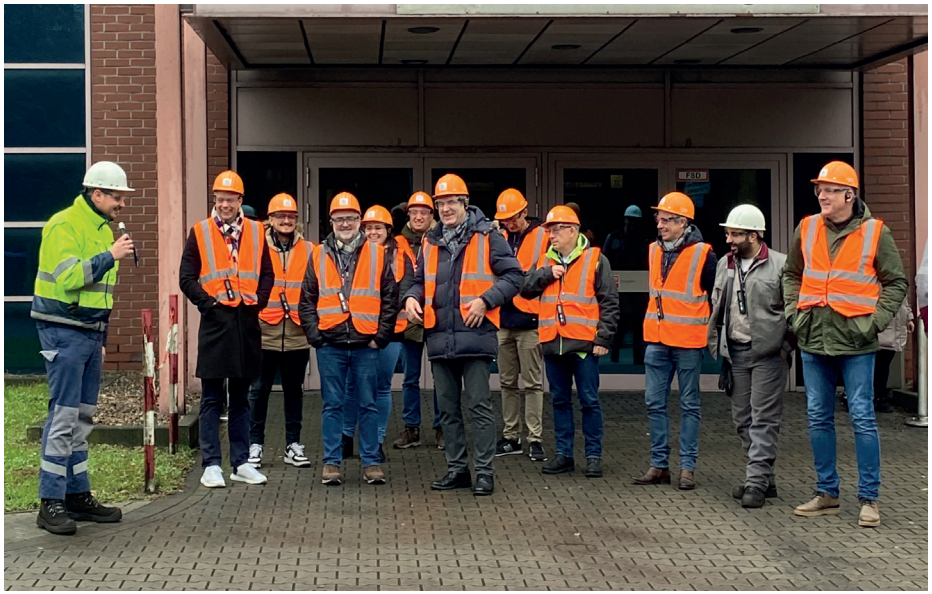
A collection of chemical reactions that converts a mixture of CO and H_2, known as syngas, into liquid hydrocarbons. In the usual implementation, carbon monoxide and hydrogen, the feedstocks for FT, can easily be produced from biomass in a process known as gasification Torrefied Biomass with its excellent gasification characteristics is an ideal feedstock to FT. The process then converts these gases into synthetic lubricant or fuel. This process has received intermittent attention as a source of producing carbon-neutral liquid hydrocarbon fuels such as SAF.

Gasification

Gasification is a thermochemical process that converts carbon-based materials, such as coal or biomass, into a mixture of combustible gases, primarily carbon monoxide (CO) and hydrogen (H_2), known as syngas. (This conversion is achieved by reacting the material at high temperatures (typically above 700°C) with a controlled amount of oxygen and/or steam, without fully burning the fuel. The resulting syngas can then be used as a fuel or as a feedstock for producing various chemicals and fuels.)

Grindability

Grindability is the ability of a material to be made smaller by grinding. The lower the index the harder a material to be ground. The thermally treated biomass grindability index TTBGI is described in ISO TS 21596. For coal, grindability is typically measured through the Hardgrove Grindability Index as described in ISO 5074.



Gross calorific value / higher heating value / GCV/Ho/^{q}V,gr

Measured value of specific energy of combustion of a solid fuel 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. The result of combustion is assumed to consist of gaseous, oxygen, nitrogen, carbon dioxide and sulphur dioxide, of liquid water (in equilibrium with its vapor) saturated with carbon dioxide under conditions of the bomb reaction, and of solid ash, all at the reference temperature and at constant volume.

H/Corg Ratio

The molar hydrogen to organic carbon ratio is an important indicator for the degree of carbonization and for carbon stability and by this persistence and does serves to classify biochar.

Heat recovery systems (efficiencies)

A heat recovery system is a mechanical system designed to recapture waste heat from one source and use it for another purpose. These systems improve energy efficiency in biomass conversion processes by reducing the need to generate new heat or by utilizing otherwise lost thermal energy, resulting in lower operational costs and reduced environmental impact.

Homogeneity of product

Refers to the degree to which the physical and chemical properties of the product are uniform throughout a given batch or among different batches. A homogeneous product exhibits consistent characteristics such as composition, size, moisture content, density, and other relevant specifications, ensuring predictable performance, handling, and processing. For industrial use, homogeneity means reliability — the product behaves the same way each time.

Hydrothermal carbonisation (HTC)

Hydrothermal carbonization (HTC) is a thermochemical conversion process for wet biomass and organic wastes that involves treatment with hot compressed water. It avoids drying of the feedstock and operates at a lower temperature than conventional thermal conversion technologies, giving rise to a carbonaceous solid and resulting in a hydrochar of improved fuel quality compared to the initial biomass. However, the aqueous fraction resulting from this process, known as process water, is a problematic secondary product that requires effective treatment due to its high chemical oxygen demand and the presence of various nutrients.

Hydrophilic

Having the propensity to attract water.

Hydrophobic

Having the propensity to repel water - the loss of the hydroxyl group during torrefaction makes the biomass hydrophobic.

Inorganic matter

Non-combustible fraction of a fuel.

Inertinite

Inertinite is one of the primary maceral groups to be found not just in coal but also in pyrogenic biocarbon. It is characterized as a carbon-rich, thermally stable component that originates from plant material that has undergone partial oxidation prior to pyrolytic treatment. Inertinite components are less reactive in biocarbon combustion or gasification processes but contributing to its long-term presence and extra slow degradation in soil or other environments. Inertinite formations during biomass carbonization seem to be encouraged by partial oxidation of the biomass prior to carbonization.

Latent heat / sensible heat (phase changes)

Sensible heat is the amount of heat added to (or removed from) a material that causes a change in temperature without changing its physical state. In biomass torrefaction and carbonisation, sensible heat is responsible for raising the temperature of the biomass to the desired processing level (typically 200–300°C for torrefaction). It is “sensed” as a temperature rise.

Leachade hazardousness

The term refers to the potential of a material to release harmful substances when it comes into contact with water, particularly through processes like leaching (i.e., when water percolates through the material and carries dissolved substances with it).

Leachate hazardousness is the degree to which water interacting with a solid material (e.g., torrefied or carbonised biomass) may extract and mobilize harmful chemical compounds, such as heavy metals, salts, or organic pollutants, potentially posing risks to human health or the environment.

Life cycle analysis (LCA)

A life cycle analysis is a systematic method for evaluating all environmental impacts that arise (directly or indirectly) along the life cycle of a product. A LCA will provide information on the overall environmental footprint of a product and make such footprints comparable.

Mass and energy (M&E) balance

The mass (material) and energy balance is based on the laws of conservation of mass and energy. It describes the handling of these two quantities in a process. It also makes clear which proportions of the supplied quantities are converted into the desired products and which quantities remain unused. The balances can be established for the overall process (plant) or various levels of the process. M&E balances are mostly shown as flow diagrams or Sankey diagrams.

Mass yield

Mass yield is the ratio of the dry mass of the solid product obtained after thermal processing (e.g., torrefaction or carbonisation) to the original dry mass of the raw biomass, expressed as a percentage. It’s a key indicator of process efficiency and material retention.

Mass flow rates

The amount of mass moving through a system per unit of time, typically used to describe the flow of biomass feedstock, gases, or products in a processing system like a torrefaction or carbonisation reactor.

Metallurgical coal

Also called coking coal is a carbon-rich coal with specific chemical and physical properties — such as low ash, low sulphur, and the ability to soften, liquefy, and re-solidify into coke when heated in the absence of air — making it suitable for producing metallurgical coke, a key reductant and energy source in blast furnace steel production.

Moisture / moisture content / M

Amount of water in the fuel with reference to wet basis.

Moisture at dry basis / U

Moisture content at dry basis amount of water in the fuel with reference to dry basis. This term is used in various industries. In solid biofuels moisture with reference to wet basis is used.

Net calorific value / lower heating value / NCV/Hu/ q_p,net

Calculated value of specific energy of combustion of a solid fuel burned in oxygen under such conditions that all the water of the reaction products remain as water vapor. The net calorific value is calculated from the gross calorific value at either constant pressure or at constant volume. The net calorific value at constant pressure is however the one generally used.

Off-gassing Spontaneous emission of condensable (e.g. terpenes) and non-condensable gases (e.g. carbon-monoxide, carbon-dioxide, methane) from biomass.

Off-gassing characteristics Off-gassing characteristics describe the type, quantity, composition, and behaviour of gases released during the thermal decomposition of biomass in processes like torrefaction or carbonisation.

Organic matter Combustible fraction of the biofuel.

Pelleting Agglomeration of solid biomass with or without additives usually with a cylindrical form, a random length of typically 5 mm to 40 mm, a diameter from 6 to 12 mm and broken ends.

Persistence Meaning the persistent C in biochar after a defined period of time, so that after a certain period of time, for example after 100 or 1000 years, C remains in biochar.

Photosynthesis Photosynthesis is the process by which green plants prepare their own food from carbon dioxide and water by using sunlight energy in the presence of chlorophyll. During the process of photosynthesis, which consists of a “light” and a “dark” reaction, cells use carbon dioxide and energy from the sun to make sugar molecules and oxygen. These sugar molecules are the basis for more complex molecules made by the photosynthetic cell, such as glucose. $6CO_2 + 6H_2O +$ Light energy $\rightarrow C_6H_{12}O_6$ (sugar) $+ 6O_2$

Pressing aid Additive used for enhancing the production of densified fuels.

Product standard ISO 17225-8 is currently the only standard that defines qualities of products received from thermal treatment of biomasses with an optimized mass and energy balance and the minimization of emissions independent of the process applied. More product standards in the area will be developed.

Proximate analysis Analysis of a solid fuel reported in terms of moisture, volatile matter, ash and fixed carbon.

Pyrogenic biocarbon An umbrella term discussed in ISO TC 238 for all thermally treated biomass, regardless of the degree of devolatilization.

Pyrolysis Pyrolysis is the heating of an organic material, such as biomass, in the absence of oxygen to prevent combustion. The heat applied into the process decomposes the cellulose, hemicellulose and lignin and deconstructs the solid biomass into a (combustible) gas and solid fraction (biocarbon). Even though pyrolysis is often used as the umbrella term for the thermal treatment of biomass, today it is more likely to be attributed to medium or higher carbonization, which is operated with a focus on the production of liquid fuels.

Reaction energies Reaction energies refer to the amount of energy released or absorbed during the thermal conversion reactions involved in biomass torrefaction and carbonisation processes.

Self-heating Under the UN transport classification system, self-heating substances are defined as: substances or mixtures, other than pyrophoric substances, which, in contact with air and without an energy supply, are liable to self-heat.

Solid recovered fuel Solid fuel prepared from non-hazardous waste utilized for energy recovery in incineration or co-incineration plants.

Solid volume Volume of a mass of particles excluding the volume of the void spaces between the particles.

Stacked volume Volume of stacked material including the space between the material pieces.

Steam explosion Physiochemical pre-treatment where high-pressure saturated steam is injected into a reactor with biomass, heating the biomass and promoting hydrolysis of the hemicellulose fraction and facilitating subsequent dehydration to furanic compounds. After some time, the pressure in the reactor is released in a rapid decompression which ruptures the biomass fibers and further degrades the biomass structures.

Supply chain Overall process of processing, transporting and handling raw materials from the point of collection to the point of delivery to the end-user.

Syngas Syngas is a mixture of gases primarily composed of hydrogen (H_2) and carbon monoxide (CO), with varying amounts of carbon dioxide (CO_2), methane (CH_4), water vapor, and other impurities. It is produced through the gasification or partial oxidation of carbonaceous materials (such as biomass, coal, or waste) and is used as a fuel or as an intermediate for chemical synthesis.

Thermogravimetric analysis (TGA) In a thermogravimetric analysis, the weight loss of volatile organic compounds is determined over the gradual increase of temperature in the absence of air (oxygen). Usually, a TGA is expressed in a thermogravimetric diagram.

Transportable moisture limit (TML) The maximum moisture content of a cargo which is considered safe for carriage in bulk; that is, a cargo with a moisture content in excess of the TML may liquefy during transport, posing a risk to the stability of the ship. The TML is determined through laboratory testing, typically based on the material's Flow Moisture Point (FMP), using tests specified in the IMSBC Code (Appendix 2). The TML is then derived from this value: TML= 0,9 x FMP meaning a cargo is only considered safe for shipment if its actual moisture content ≤ TML.

Torrefaction Torrefaction is a thermochemical conversion process which is performed under atmospheric pressure at temperatures between 200°C and 350°C mostly in an inert condition (absence of oxygen). During torrefaction, moisture and some volatile organic compounds volatilize from the biomass leading to changes also in physical properties of the solid biomass.

Torrefaction after Pelletisation (TAP) In this set up, biomass is first ground and pelletized in a standard pelletisation procedure and the product is thereafter thermally treated.

Torrefaction before Pelletisation (TBP) A process where biomass is first coarsely ground if at all, torrefied, milled and at the end of the process densified to pellets.

Torgas/Torrgas Torgas or torrgas is one of the names for the gas that is driven off the solid biomass in the thermal process of torrefaction. It is a hydrocarbon rich gas containing aside other longer chain molecules, larger fractions of CO and H_2. It can serve as lean gas energy source. Through condensation, wood vinegar and wood tar can be separated. Through cracking and separation processes, a clean syngas can be produced for further processing.

Ultimate analysis / elementary analysis / elemental analysis

Analysis of a fuel reported in terms of its ash, moisture, total carbon, total hydrogen, total nitrogen, and total sulphur measured at specified conditions and total oxygen calculated using a formula.

Van Klevelen Relation (Diagram)

Classifies different solid fuels (peat, lignite, sub-bituminous coal, bituminous coal, anthracite, biomass types, etc.) by plotting the hydrogen-to-carbon (H/C) ratio on the y-axis and the oxygen-to-carbon (O/C) ratio on the x-axis and by this clusters different types of organic substances (e.g., lignin, lipids, carbohydrates) in different regions. It helps visualize chemical changes such as oxidation, dehydration, or decarboxylation. Biomass typically clusters in a region with higher H/C and O/C relative to coal. In thermal treatment of biomass the goal is to reduce the O and/or H content (thus lowering H/C or O/C) to make the biomass more “coal-like” in behaviour.

Volatiles, volatile matter

The material that is released from biomass when the latter is heated in the absence of oxygen under specific conditions (and corrected for moisture content of feedstock).

Volatile organic compounds (VOCs)

Volatile organic compounds refer to organic chemicals that are released as gases during the thermal decomposition of biomass. These compounds typically result from the degradation of the primary components of biomass: cellulose, hemicellulose, and lignin. Depending on temperature, the biomass is exposed to, different types and qualities of VOCs will result.

Water sorption

Gain or loss of water/moisture by solid biofuels through absorption or adsorption when the solid biofuel is exposed to water or varying levels of air humidity.

Weathering

The controlled exposure of a material to ambient environmental conditions (air, moisture, temperature, etc.) over time, to observe physical or chemical changes — particularly whether it self-heats, oxidizes, or decomposes.

Wet basis / wb

Condition in which the solid fuel contains moisture.

Wet torrefaction

Torrefaction carried out in an aquatic environment, literally hot pressurized water.

Wood tar

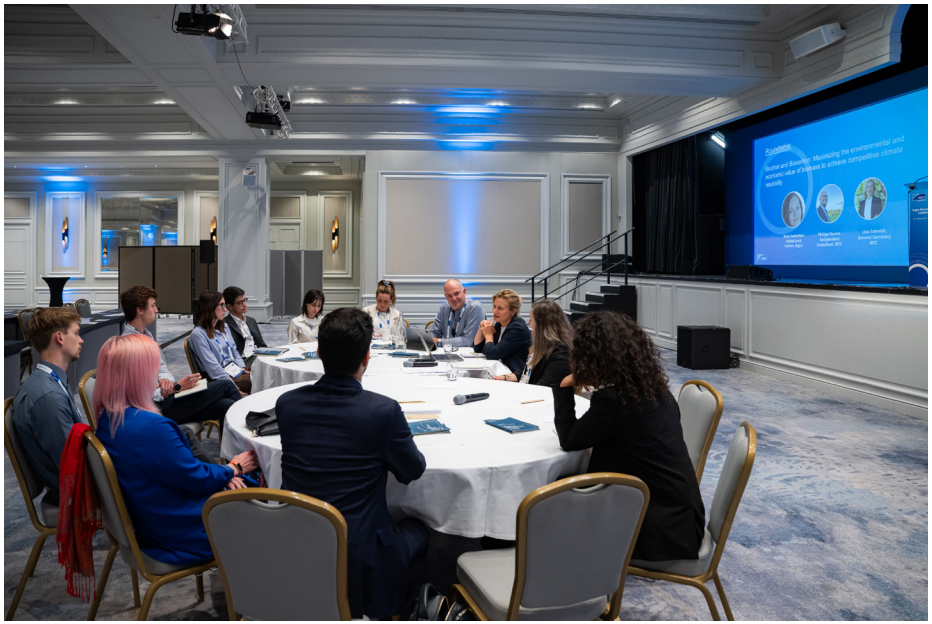
A liquid that is obtained as one of the condensates from the gaseous products of torrefaction or carbonization. Tar qualities differ according to biomass species (mix) torrefied. Wood tar may be fractioned.

Wood vinegar

Also known as pyroligneous acid or wood acid is one of the possible condensates from Tor- or Syngases.

Abbreviations

BCR - Biogenic Carbon Reference	In the context of biomass, bioenergy, or carbon markets, it refers to a baseline or reference value used to quantify the biogenic carbon content in a material or product.
CAS Registry Number / CAS RN / CAS Number	A unique identification number, assigned by the Chemical Abstracts Service (CAS) in the US to every chemical substance described in the open scientific literature, in order to index the substance in the CAS Registry.
CBAM - Carbon Border Adjustment Mechanism	It is an EU regulation aimed at levelling the playing field for EU industries by imposing a carbon price on imports of certain goods from countries with less stringent climate policies, to prevent carbon leakage and encourage global emissions reduction.
CINS – Cargo Incident Notification System.	A global, industry-led database and information-sharing platform used by major container shipping lines to record, analyse, and exchange information about cargo-related incidents — especially those involving dangerous goods, mis-declared cargo, or non-compliant packaging.
CORSIA - Carbon Offsetting and Reduction Scheme for International Aviation	The first global market-based scheme that applies to a sector. It complements other aviation in-sector emissions reductions efforts such as technological innovations, operational improvements and sustainable aviation fuels to meet the ICAO aspirational goal of carbon neutral growth.
CRCF - Carbon Removals and Carbon Farming Regulation	This regulation, officially designated as Regulation (EU) 2024/3012, was adopted by the European Union in November 2024 and published in the Official Journal on December 6, 2024.
CTU Code - Code of Practice for Packing of Cargo Transport Units	CTU Code is an international guideline jointly developed by the IMO (International Maritime Organization), ILO (International Labour Organization), and UNECE (United Nations Economic Commission for Europe). It provides uniform safety standards and best practices for the packing, securing, handling, and transport of cargo in containers, swap bodies, trailers, and other cargo transport units (CTUs).
EPD - Environmental Product Declaration	An EPD is a standardized document that provides transparent and comparable information about the environmental impact of a product throughout its life cycle, based on life cycle assessment (LCA) methodology.



EUDR - EU Deforestation Regulation

It is an EU regulation aimed at preventing products linked to deforestation or forest degradation from being placed on the EU market. It applies to commodities such as soy, palm oil, cocoa, coffee, timber, and cattle, requiring operators to trace and verify the legal and deforestation-free origin of these products.

EU ETS - European Union Emissions Trading System

It is the cornerstone of the EU's policy to combat climate change and a key tool for reducing greenhouse gas emissions cost-effectively.

IMDG Code - International Maritime Dangerous Goods Code

The IMDG Code is an international guideline developed by the International Maritime Organization (IMO) for the safe transportation of dangerous goods by sea. It covers the classification, packing, labelling, handling, stowage, and documentation of hazardous materials to prevent accidents and ensure safety during maritime shipping.

IMSBC Code - International Maritime Solid Bulk Cargoes Code

The IMSBC Code is an international regulation developed by the International Maritime Organization (IMO) that sets standards for the safe stowage, segregation, and transport of solid bulk cargoes by sea.

IMO - International Maritime Organization

The IMO is a specialized agency of the United Nations responsible for regulating shipping. Its main goals are to ensure safe, secure, and efficient maritime transport while preventing marine pollution from ships.

PCF - Product Carbon Footprint

In the context of biomass, biocarbon, or other industrial products, it refers to the total greenhouse gas (GHG) emissions associated with a product over its entire life cycle, typically expressed in CO_2-equivalents (CO_2e).

QMS - A Quality Management System

A structured framework of policies, processes, and procedures used by an organization to ensure that its products or services consistently meet customer and regulatory requirements and to drive continuous improvement.

RED II – Renewable Energy Directive (Directive (EU) 2018/2001)

RED II sets the current EU framework for promoting the use of renewable energy, including sustainability criteria for bioenergy.

RED III – Renewable Energy Directive (upcoming revision under the European Green Deal)

RED III is the planned update aiming to further increase the share of renewables and strengthen sustainability and greenhouse gas emission reduction requirements.

SDS - Safety Data Sheet

An SDS is a standardized document that provides detailed information about the properties, hazards, safe handling, storage, and emergency measures related to a chemical substance or mixture.

SOLAS - International Convention for the Safety of Life at Sea

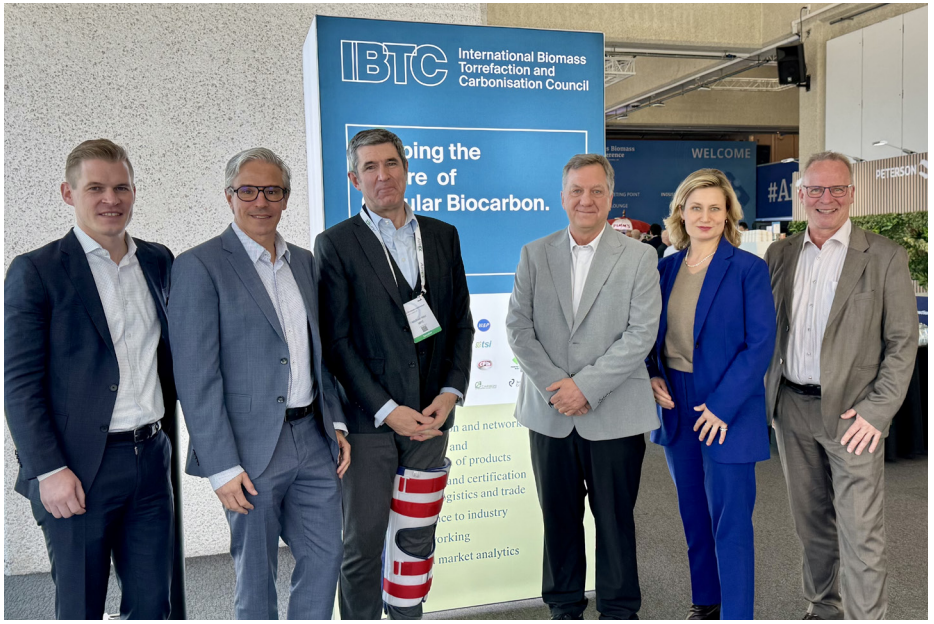
SOLAS is an international maritime treaty, developed under the International Maritime Organization (IMO) that sets minimum safety standards for the construction, equipment, and operation of ships to ensure the safety of life at sea.

Special Provision SP 978 (IMDG Code, Amendment 42-24)

SP 978 applies to carbon/charcoal under UN 1361 and replaces the earlier SP 925. It removes the previous automatic exemption from IMDG Code requirements, even when the material passes the UN self-heating test (N.4). It introduces new mandatory conditions for:

1. Proper weathering before packaging
2. Packaging, including a maximum material temperature of 40 °C at the time of packaging
3. Stowage and segregation during transport

SP 978 imposes stricter rules for non-activated carbon (UN 1361), while SP 979 provides conditional exemptions for activated carbon (UN 1362). Both become effective with IMDG Amendment 42-24.



Special Provision SP 979

SP 979 (also replacing SP 925) applies to activated carbon under UN 1362. It allows exemptions from certain IMDG Code provisions when specific conditions are met. It also introduces a new documentation requirement (IMDG 5.4.4.2): a certificate granting the exemption must accompany the cargo information required under SOLAS VI/2.

UN N.4 Test

The test determines whether a material is considered self-heating by measuring temperature rise in a defined sample over time under controlled conditions, usually at 140 °C and 100 °C in cube-shaped samples (per UN Manual of Tests and Criteria, Section 33.3.1.6).

All definitions given by IBTC refer to biomass and its treatment. Wherever in conflict with the terminology of other raw materials and goods, we refer to the understanding and definitions of ISO 16559 and 17225.

Circular Biocarbon

	Wood Pellets WWP	Steam Exploded Pellets	Torrefied Biomass Pellets/Briquettes	Bio-Carbon Pellets/Briquettes	Biochar undensified
Standard	**ISO 17225-2**	**ISO 17225-8**	**ISO 17225-8**	**ISO TC238**	**WBC cert**
Moisture content (% wt)	7–10	3–6	2–8	3–8	30% rec
Ash Content (% wt)	0.3–1.5	0.3–3	1,5-5	1,5–8	14 max
Calorific value NCV (MJ /kg)	16–17	19-21	19–23	25–32	
Volatiles (% db)	70–75	70	50–60	10–25	
Fixed carbon (% db)	20–25	20–25	25–50	60–95	>70
Bulk density (kg /m^3)	650–680	700-750	650–700	650–750	150–350
Energy density (GJ/m^3)	10,4–11	15-16	13–17	18,2–24	
Dust	average	low	average	limited/average	high
Hydroscopic properties	hydrophilic	hydrophobic	hydrophobic	hydrophobic	
Biological degradation	yes	slow	very low	no	no
Milling requirements	classic/special	HGI 40–45	HGI 40–50	HGI 45–55	
Handling properties	special/dry	easy	easy	easy	with care
Transport costs	medium	low	low	low	high
EPA PAH					6 g t-1 db
EFSA PAH					1 g t-1 db
PCB					0,2mg/kg db
H/Corg					< 0,7(< 0,4) db

Become a member

IBTC members are international companies developing biomass torrefaction or carbonisation technology, pellet/ briquette machine manufacturers, consumers of the products from various sectors and national or sectoral associations, as well as other parties with an interest in production or use of torrefied or carbonised biomass – for instance, in R&D.

IBTC offers three different membership categories:

Full Membership

is offered to companies active in the production or consumption of torrefied or carbonised biomass, as well as operators of such installations, systems or machinery suppliers to the torrefaction industry and companies trading torrefied or carbonised biomass.

Company size	Revenue	Fee 2026
Micro	≤ 2 million euros	1,700 euros
Small	≤ 10 million euros	3,850 euros
Medium	≤ 50 million euros	6,100 euros
Large	> 50 million euros	8,300 euros

The Developing Membership

is open to all parties with the clear objective of becoming full members with their projects in development. They are already on their way to becoming a full producer but don't have a commercial production, i.e. production not yet intended for the market.

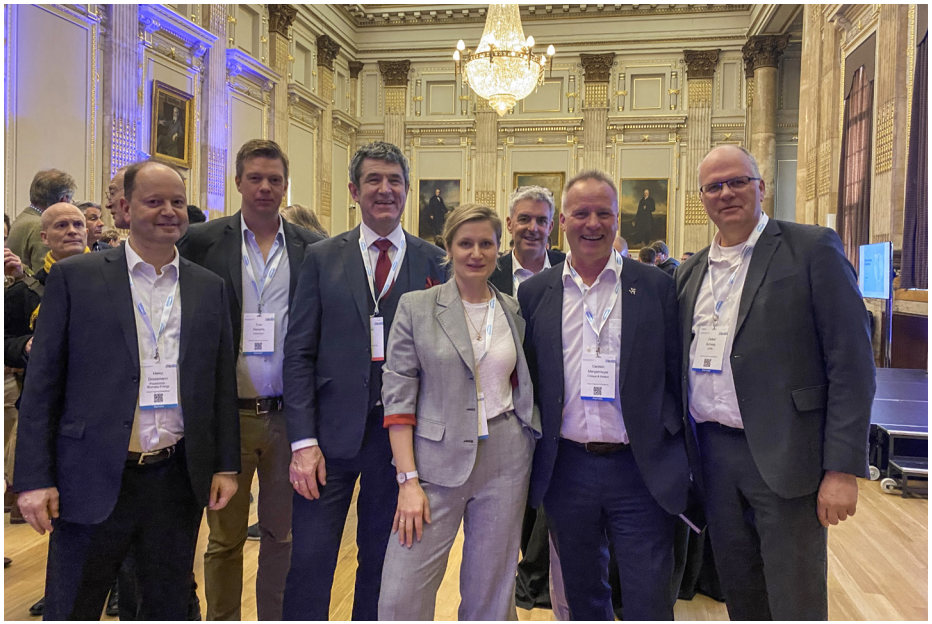
	Fee 2026
Developing Membership	1,100 euros

The Associate Membership

is open to any other companies, organisations or individuals with interest along the value chain of torrefied or carbonised biomass and supporting the objectives of IBTC, e.g. ports, terminals, logistic providers, shipping companies, stevedores, consultants, associations, research institutions, certification companies or insurance companies.

	Fee 2026
All others	1,100 euros

The stated membership fees apply to membership in the year 2026.



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→ Market promotion and networking
→ Standardization and commoditization of products
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→ Statistics and market analytics

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