BIOPOLYMERS

Non-exhaustive list of standardization committees and standards

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ISO/TC 45, Rubber and rubber products, SC 2, Testing and analysis.

ISO 19984-1:2017 Rubber and rubber products — Determination of biobased content — Part 1: General principles and calculation methods using the formulation of the rubber compound

Scope

This document specifies the general principles and the calculation methods for the determination of biobased content in rubber and rubber products, including polyurethanes, by using the compound formulation. These calculation methods are based on the mass or the carbon mass of each constituent present in the rubber or rubber product.

ISO 19984-2:2017 Rubber and rubber products — Determination of biobased content — Part 2: Biobased carbon content

Scope

This document specifies measuring methods for the determination of biobased carbon contents in rubber and rubber products, including polyurethanes. The methods focus on carbon atoms in rubber or rubber products, and determine whether the carbon-containing component is biobased or not judging from the concentration of 14C, radiocarbon isotope.

This document applies to rubber and rubber products such as raw materials, materials and final products.

ISO 19984-3:2017 Rubber and rubber products — Determination of biobased content — Part 3: Biobased mass content

Scope

This document specifies measuring methods for the determination of the biobased mass contents in rubber and rubber products.

The biobased mass content of rubber materials or final products can be determined by separating the sample into the rubber, the inorganic ingredient (including carbon black) and the solvent extract, each of whose 14C content is determined, and then converting the results to the biobased mass content using the procedure described in this document.

This document applies to NR, IR, BR, SBR, IIR, BIIR, CIIR and their modified rubbers, as well as to their mixtures.

This document uses only the accelerator mass spectrometry (AMS) method for the purpose of determination of biobased content.

ISO 20463:2018 Rubber and rubber products — Determination of combustion energy and carbon dioxide emission from biobased and non-biobased materials

Scope

This document specifies the measuring methods of the combustion energy (i.e. gross calorific value) and the carbon dioxide emission amount from biobased and non-biobased materials in rubber or rubber products.

This document applies to rubber and rubber products (including polyurethane) such as raw materials, materials and final products.

ISO TC61 Plastics, Subcommittee SC 1, Terminology

ISO 472:2013 Plastics — Vocabulary

This International Standard defines terms used in the plastics industry, including terms and definitions appearing in plastics standards (of ISO/TC 61) and general terms and definitions of polymer science used in all aspects of plastics technology.

NOTE In addition to terms in English and French (two of the three official ISO languages), this vocabulary includes the equivalent terms in German; these have been included under the responsibility of the member body for Germany (DIN). However, only the terms and definitions in the official languages can be considered as ISO terms and definitions.

ISO/TC 61, Plastics, Subcommittee SC 5, Physical-chemical properties.

ISO 16620-1:2015 Plastics — Biobased content — Part 1: General principles

Scope

This part of ISO 16620 specifies the general principles and the calculation methods for determining the amount of biobased content in plastic products. These calculation methods are based on the carbon mass or mass of each constituent present in the plastic products.

This part of ISO 16620 is applicable to plastic products and plastic materials, polymer resins, monomers, or additives, which are made from biobased or fossil-based constituents.

Knowing the biobased content of plastic products is useful when evaluating their environmental impact.

ISO 16620-2:2019 Plastics — Biobased content — Part 2: Determination of biobased carbon content

Scope

This document specifies a calculation method for the determination of the biobased carbon content in monomers, polymers, and plastic materials and products, based on the 14C content measurement.

This document is applicable to plastic products and plastic materials (e.g. plasticisers or modifiers), polymer resins, monomers, or additives, which are made from biobased or fossil-based constituents.

Knowing the biobased content of plastic products is useful when evaluating their environmental impact.

ISO 16620-4:2016 Plastics — Biobased content — Part 3: Determination of biobased synthetic polymer content

Scope

This part of ISO 16620 specifies the method of determining the amounts of biobased part in the biobased synthetic polymer in plastics products. This calculation method for biobased synthetic polymer content is based on the mass of biobased synthetic polymer in the plastics products.

This part of ISO 16620 is applicable to plastic products and plastic materials, polymer resins, monomers, or additives, which are made from biobased or fossil-based constituents.

Knowing the biobased content of plastic products is useful when evaluating their environmental impact.

ISO 16620-4:2016 Plastics — Biobased content — Part 4: Determination of biobased mass content

Scope

This document specifies a method of determining the biobased mass content in plastics products, based on the radiocarbon analysis and elemental analysis.

This document is applicable to plastic products and plastic materials, polymer resins, monomers or additives, which are made from biobased or fossil-based constituents.

This method is applicable, provided that the plastic product contains carbon element and that a statement giving its elemental composition and its biobased mass content is available.

ISO 16620-5:2017 Plastics — Biobased content — Part 5: Declaration of biobased carbon content, biobased synthetic polymer content and biobased mass content

Scope

This document specifies the requirements for the declarations and labels of the biobased carbon content, the biobased synthetic polymer content and the biobased mass content in plastic products.

This document is applicable to plastic products and plastic materials, polymer resins, monomers or additives, which are made from biobased or fossil-based constituents.

ISO/TC 61, Plastics, Subcommittee SC 14, Enviromental aspects.

ISO 22526-1:2020 Plastics — Carbon and environmental footprint of biobased plastics — Part 1: General principles

Scope

This document specifies the general principles and the system boundaries for the carbon and environmental footprint of biobased plastic products. It is an introduction and a guidance document to the other parts of the ISO 22526 series.

This document is applicable to plastic products and plastic materials, polymer resins, which are based from biobased or fossil-based constituents.

ISO 22526-2:2020 Plastics — Carbon and environmental footprint of biobased plastics — Part 2: Material carbon footprint, amount (mass) of CO2 removed from the air and incorporated into polymer molecule

Scope

This document defines the material carbon footprint as the amount (mass) of CO2 removed from the air and incorporated into plastic, and specifies a determination method to quantify it.

This document is applicable to plastic products, plastic materials and polymer resins that are partly or wholly based on biobased constituents.

ISO/DIS 22526-3 Plastics — Carbon and environmental footprint of biobased plastics — Part 3: Process carbon footprint, requirements and guidelines for quantification

Scope

This document specifies principles and requirements for the quantification and reporting of the Process Carbon Footprint of biobased plastics (see ISO/CD 22526-1), being a partial carbon footprint of a bioplastic product, based on ISO 14067 and consistent with the ISO standards on life cycle assessment (ISO 14040 and ISO 14044).

This document is applicable to Process Carbon Footprint studies (P-CFP) of plastic materials, being a partial carbon footprint of a product, whether or not the results are intended to be publicly available.

The Process Carbon Footprint study is carried out according to ISO 14067 as a partial carbon footprint, using the specific conditions and requirements specified in this standard.

Requirements and guidelines for the quantification of a partial carbon footprint of a product (partial CFP) are provided.

Where the results of a P-CF study are reported according to this International Standard, procedures are provided to support transparency and credibility, and also to allow for informed choices.

Offsetting is outside of the scope of this International Standard.

ISO 22766:2020 Plastics — Determination of the degree of disintegration of plastic materials in marine habitats under real field conditions

Scope

This document specifies test methods for the determination of the degree of disintegration of plastic materials exposed to marine habitats under real field conditions.

The marine areas under investigation are the sandy sublittoral and the sandy eulittoral zone where plastic materials can either be placed intentionally (e.g. biodegradable fishing nets) or end up as litter due to irresponsible human behaviour. This depends on their physical characteristics, form and size of the materials, and on water currents and tidal movements.

This document specifies the general requirements of the apparatus, and the procedures for using the test methods described.

The determination of the level of disintegration of plastic materials exposed to pelagic zones such as the sea surface or the water column above the seafloor are not within the scope of this document.

This document is not suitable for the assessment of disintegration caused by heat or light exposure.

The described field test is a disintegration test and not a biodegradation test. Therefore, it cannot be used for demonstrating biodegradation or for making unqualified claims such as “biodegradable in marine environment” and similar.

ISO/TC 207, Environmental management, Subcommittee SC 1, Environmental management systems.

ISO/DIS 14009 - Environmental management systems — Guidelines for incorporating material circulation in design and development

Scope

This document provides guidelines to assist organizations in establishing, documenting, implementing, maintaining and continually improving material circulation in their design and development in a systematic manner, using an environmental management system (EMS) framework.

These guidelines are intended to be used by those organizations that implement an EMS in accordance with ISO 14001. The guidelines can also help in integrating material circulation strategies in design and development when using other management systems. The guidelines can be applied to any organization regardless of its size or activity.

This document provides guidelines for design strategies on material circulation to achieve the material efficiency objectives of an organization, by focusing on the following aspects:

- Type and quantity of materials in products
- Product lifetime extension
- Recovery of products, parts, and materials

In design and development, many aspects are considered, such as safety, performance, and cost. Although important, they are not addressed in this document.

ISO/TC 207, Environmental management, Subcommittee SC 7, Greenhouse gas management and related activities

ISO 14067:2018 - Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification

Scope

This document specifies principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product (CFP), in a manner consistent with International Standards on life cycle assessment (LCA) (ISO 14040 and ISO 14044).

Requirements and guidelines for the quantification of a partial CFP are also specified.

This document is applicable to CFP studies, the results of which provide the basis for different applications (see Clause 4).

This document addresses only a single impact category: climate change. Carbon offsetting and communication of CFP or partial CFP information are outside the scope of this document.

This document does not assess any social or economic aspects or impacts, or any other environmental aspects and related impacts potentially arising from the life cycle of a product.

ISO/TC 224, Service activities relating to drinking water supply, wastewater and stormwater systems.

ISO/TR 24524:2019 Service activities relating to drinking water supply, wastewater and stormwater systems — Hydraulic, mechanical and environmental conditions in wastewater transport systems

Scope

This document details the hydraulic, mechanical and environmental conditions generally found in wastewater transport systems from toilets through to wastewater treatment plants, the general powers of wastewater services to manage discharges to sewers, and the responsibilities imposed on wastewater services by applicable local, regional or national legislation.

ISO/TC 38, Textiles

ISO 21701:2019 - Textiles — Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate

Scope

This document specifies a test method for the determination of the biodegradability of the hydrolysate of textile materials obtained after accelerated hydrolysis under controlled composting conditions by measurement of the amount of evolved carbon dioxide with a gas chromatography.

This test method can be applied to petroleum-based man-made biodegradable textile materials which are manufactured from polyethylene terephthalate succinate, polycaprolactone, polypropylene carbonate, polybuthylene succinate or copolymer using them.

CEN TC411 Bio-based products

Scope:

Development of standards for bio-based products covering horizontal aspects. This includes consistent terminology, sampling, certification tools, bio-based content, application of and correlation towards life cycle analysis, sustainability criteria for biomass used and for final products, and aspects where further harmonization is needed on horizontal level; ii. Development of standards for bio-solvents, covering product functionality, biodegradability and, if necessary, product specific aspects not covered under i.

List of standards

00411002, CEN/TR 16721:2014, Bio-based products - Overview of methods to determine the bio-based content

Scope

This Technical Report gives an overview of methods which can be used for the determination of the bio-based content of solid, liquid and gaseous products. It describes more specifically:

a) a method using the radiocarbon analysis and elemental analysis: this method is based on a statement and a verification of the composition of the products;
b) methods based on measurement of stable isotopic ratio; and
c) a method based on the material balance.

This Technical Report gives guidance on the applicability of the different methods.
This Technical Report also gives recommendations for the further development of European Standards for the determination of the bio-based content.

00411003, EN 16575:2014, Bio-based products – Vocabulary

Scope

This European Standard defines general terms to be used in the field of bio-based products, including horizontal aspects relevant for bio-based product standards.

NOTE Though the terms in this standard are horizontally applicable to bio-based products, this standard focuses on areas other than food, feed and energy applications, where terms may be defined in existing specific standards.

00411004, EN 16848:2016, Bio-based products - Requirements for Business to Business communication of characteristics using a Data Sheet

Scope

This European Standard specifies a template for the reporting and communication of characteristics, including recovery and disposal options, of bio-based products designed for business to business transactions.
This horizontal European Standard is intended to be used as a tool to generate and transfer information in the industrial chain and/or as an input for product specific standards and certification schemes.
This European Standard does not contain requirements for bio-based products, but requirements for claims about bio-based products.
Business to consumer communication is not covered by this standard

00411005, EN 16751:2016, Bio-based products - Sustainability criteria

Scope

This European Standard sets horizontal sustainability criteria applicable to the bio-based part of all bio-based products, excluding food, feed and energy, covering all three pillars of sustainability; environmental, social and economic aspects. If the product is partly bio-based, this European Standard can only be used for the bio-based part since it does not address non-bio-based (fossil, mineral) parts of a product.
This European Standard can be used for two applications; either to provide sustainability information about the biomass production only or to provide sustainability information in the supply chain for the bio-based part of the bio-based product.
This European Standard sets a framework to provide information on management of sustainability aspects.
This European Standard cannot be used to make claims that operations or products are sustainable since it does not establish thresholds or limits.
This European Standard can however be used for business-to-business (B2B) communication or for developing product specific standards and certification schemes.

00411006, EN 16760:2015, Bio-based products - Life Cycle Assessment

Scope

This European Standard provides specific life cycle assessment (LCA) requirements and guidance for bio-based products, excluding food, feed and energy, based on EN ISO 14040 and EN ISO 14044.
This European Standard covers bio-based products, derived wholly or partly from biomass.
This European Standard provides guidance and requirements to assess impact over the life cycle of bio-based products with the focus on how to handle the specificities of the bio-based part of the product.
The applications of LCA as such are outside the scope of this European Standard. Clarifications, considerations, practices, simplifications and options for the different applications, are also beyond the scope of this European Standard. In addition, this European Standard may be applied in studies

that do not cover the whole life cycle, with justification e.g. in the case of business-to-business information, such as cradle-to-gate studies, gate-to-gate studies, and specific parts of the life cycle (e.g. waste management, components of a product).

00411008, EN 16785-1:2015 Bio-based products - Bio-based content - Part 1: Determination of the bio-based content using the radiocarbon analysis and elemental analysis

Scope

This European Standard specifies a method of determining the bio-based content in products, based on the radiocarbon analysis and elemental analysis.
This European Standard is applicable to any solid, liquid and gaseous product containing carbon element, provided that a statement giving the composition and the origin of the product is available. This method is not needed for the determination of the bio based content in natural products wholly derived from biomass.

00411009, EN 16640:2017+ AC:2007, Bio-based products - Bio-based carbon content - Determination of the bio-based carbon content using the radiocarbon method

Scope:

This European Standard specifies a method for the determination of the bio-based carbon content in products, based on the 14C content measurement.
This European Standard also specifies three test methods to be used for the determination of the 14C content from which the bio-based carbon content is calculated:

- Method A: Liquid scintillation-counter method (LSC) (normative);
- Method B: Beta-ionization (BI) (informative);
- Method C: Accelerator mass spectrometry (AMS) (normative).

The bio-based carbon content is expressed by a fraction of sample mass or as a fraction of the total carbon content. This calculation method is applicable to any product containing carbon, including bio composites.
NOTE This European standard does not provide the methodology for the calculation of the biomass content of a sample see prEN 16785-1 [5] and prEN 16785-2 [6].

00411010, CEN/TR 16957:2016, Bio-based products - Guidelines for Life Cycle Inventory (LCI) for the End-of-life phase

Scope:

This Technical Report provides guidance on how to compile an inventory for the end-of-life phase in LCA of bio-based products.

NOTE The order of the end-of-life options indicated in Figure 1 respect the Directive 2008/98/EC on waste. This list is not exhaustive, but illustrates the content of this Technical Report.

00411011, EN 16785-2:2018, Bio-based products - Bio-based content - Part 2: Determination of the bio-based content using the material balance method

Scope:

This part of EN 16785 specifies a method of determining the bio-based content in products using the material balance applied to a representative product batch in a production unit.
This European Standard is applicable to any solid, liquid and gaseous bio-based product containing carbon, obtained by chemical synthesis, mixing or assembling, provided that:

- for a product batch, the composition of the product and the bio-based content of each input, output and loss in the production unit are known; and
- the bio-based content of the product is verifiable by analysis.

This method incorporates only the physical parts of the input and output stream as present in the final product, and does not incorporate material inputs for the energy to be used during the production process.
This method is not needed for the determination of the bio-based content in natural products wholly derived from biomass.

00411013, EN 16935:2017, Bio-based products - Requirements for Business-to-Consumer communication and claims

Scope:

This European Standard specifies requirements for transparent and non-misleading business-to consumer communication of characteristics of bio-based products by means of labelling and claims. It does not specify requirements for bio-based products.
This European Standard is intended to be used as a tool to generate and transfer information to the consumer and/or as an input for product-specific standards and certification schemes.
Business to business communication is covered by FprEN 16848.[1]
NOTE This standard is applicable to all claims which are based on or make reference to bio-based content (e.g. vegetable-based, plant-based).

00411014, CEN/TR 17341:2019, Bio-based products - Examples of reporting on sustainability criteria

Scope

This document provides examples of business to business (B2B) reporting in accordance with EN 16751 Bio-based products -Sustainability criteria. This Technical Report also offers some additional guidance to the user of EN 16751.

00411015, EN 17351:2020, Bio-based products - Determination of the oxygen content using an elemental analyser

Scope

This document specifies a direct method for the determination of the total oxygen content in bio-based products using an elemental analyser. The scope is limited to products containing elements carbon, hydrogen, oxygen, nitrogen, chloride, bromide and iodide without fluoride, representing at least 95 % of the composition of the product to be analysed.
NOTE 1 Bio-based materials can contain both organic and inorganic components. The oxygen content might originate both from the organic and/or the inorganic components. The inorganic components are not bio-based but will nevertheless contribute to the amount of oxygen determined by the following prescribed methods and therefore influence the results in terms of oxygen content. According to the current state of the art, it is not possible by isotopic measurements to establish a distinction between oxygen originating from biomass and oxygen originating from non-biomass.
NOTE 2 Although this document has been drafted for the purpose of the determinations dealing with bio-based content, it can be also used as a standalone standard for determination of oxygen in organic compounds.
NOTE 3 For the purposes of this document, the unit "% (m/m)" is used to represent the oxygen content of a material.
NOTE 4 The method specified in this document involves a direct measurement method for the determination of oxygen content. This method contains many similarities with the ASTM D5622 [1] standard for gasoline and methanol fuels. The method specified in this document is specifically developed and validated for bio-based products. In addition, this method provides more accurate and unadulterated measured values for oxygen in contrast to indirect measurement methods for the determination of oxygen (e.g. ASTM D 3176 [2]).

00411016, EN 16766:2017, Bio-based solvents - Requirements and test methods

Scope

This European Standard sets the requirements for bio-based solvents in terms of their bio-based content, their technical properties and test methods. It lays down the characteristics and details for assessment of bio-based solvents that:

- are fit for purpose in terms of performance related properties;
- comply with the health, safety and environmental requirements which apply generally to solvents; and
- are derived from biomass.

This European Standard specifies solvent classes, based on the percentage of bio-based carbon content and bio-based content.
NOTE EN 16575 defines the term "bio-based" as derived from biomass and clarifies that "bio-based" does not imply "biodegradable". In addition, "biodegradable" does not necessarily imply the use of "bio-based" material.
In addition, this document sets requirements on information to be provided regarding sustainability aspects.

00411017 Bio-based products- Use of stable isotope ratios of Carbon, Hydrogen, Oxygen and Nitrogen as tools for verification of the origin of bio-based feedstock and characteristics of production processes – overview of relevant existing applications – New Project

Scope

The stable isotope ratios of carbon, hydrogen, oxygen and nitrogen can be used to obtain information about the origin of bio-based feedstock and characteristics of production processes of bio-based products. However, no or limited attention for the use of the elements nitrogen and sulphur is given in this document due to the fact that these applications are not yet available.
This Technical Report provides an overview of existing applications of isotope ratio analysis of carbon, hydrogen, oxygen and nitrogen that are relevant to the analysis of bio-based feedstocks, products and production processes

CEN TC139 Paints and varnishes

00139594, EN ISO 10927:2018, Plastics - Determination of the molecular mass and molecular mass distribution of polymer species by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS) (ISO 10927:2018)

This document specifies a general method for determining the average molecular mass and molecular mass distribution of polymers (see Reference [1]) from 2 000 g · mol−1 to 20 000 g · mol−1 by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS).
The average molecular masses and molecular mass distributions are calculated from a calibration curve constructed using synthetic-polymer and/or biopolymer standards. This method is therefore classified as a relative method.
The method is not applicable to polyolefins or to polymers with a polydispersity >1,2.

CEN TC249 Plastics

00249A29 Plastics - Environmental Aspects – Vocabulary (New project)

Scope

This document specifies terms and definitions in the field of plastics related to environmental aspects and provide a common vocabulary basis for:

- biodegradability
- biobased plastics
- carbon and environmental footprint
- circular economy
- mechanical and chemical recycling
- plastics in environments

- resource
- waste management

This standard aims to provide a comprehensive glossary which uses the applicable definitions providing when appropriate additional notes to make these definitions understandable without reference to other documents.
As far as possible definitions are adapted from existing standards. But when the intention or definition is unclear additional context or definitions are updated or added
Terms which are also applicable to rubber will be indicated.

Some links:

https://www.cen.eu/work/areas/chemical/biobased/pages/default.aspx

https://www.biobasedeconomy.eu/centc-411-bio-based-products/

https://www.iso.org/obp (online browsing platform for ISO standards – get reference, foreword, introduction, scope, **terms & definitions**)