

FACT SHEET

European Bioplastics

Bioplastics – Industry standards & labels

Relevant standards and labels for bio-based and biodegradable plastics

What are standards and why are they important?

Standardisation is an effort by industrial stakeholders to define generally accepted criteria and guidelines for the description of products, services, and processes. The aim is to ease competition and commercial growth by overcoming barriers that result from unclear or inconsistent specifications and communication, to introduce benchmarks for desirable quality requirements, and to prevent fraudulent market behaviour. Adherence to standards is typically voluntary, which means that it is up to individual market participants to seek compliance with a standard or not¹.

There are two different types of evaluation systems, which are both commonly called standards: On the one hand, test methods describe methodological criteria and typically lay out the procedures that need to be followed. On the other hand, there are specifications, which have a normative function and define a set of pass and fail criteria as the requirements that need to be met in order for a product or material to be compliant with the standard. While these two types are often complementary, it is the latter 'specification' type of standard that ultimately defines compliance criteria. Compliance with test methods alone cannot substantiate claims to conformity with hard-and-fast industry standards in the absence of pass/fail criteria.

While there is no comprehensive EU legislation specifically harmonising standards for environmental and product marketing claims, the European Commission as well as national governments, ministries, and independent standardisation institutes have issued a multitude of standards that can serve as a basis for evaluating claims for bioplastics² and other bio-based products.

The key standardisation bodies creating standards are ISO (International Organization for Standardization), CEN (European Committee for Standardisation) and ASTM (American Society for Testing and Materials). In addition, there are many national standardisation organisations. The harmonisation of standards on a supranational level, for example on the EU-level through CEN, certainly has added value insofar as standards should apply equally across participants in the same market.



Labels that are based on a standard are an easy way to communicate at first sight conformity with a standard. They are often

¹ In the latter case, only self-declaration is suitable, eg. according to the specifications in ISO 14021. On request, these claims shall be proven by means of test reports.

² Bioplastics are a broad family of materials that are either bio-based, biodegradable, or both.

understood – and indeed intended – to claim for the labelled product some form of superiority over unlabelled products. An accepted standard will be used for certification of certain properties and the according label or logo will be awarded for easy identification. Where such labels exist for the listed standards, they will be introduced alongside the corresponding standard below.

Relevant standards and labels for bio-based plastics

Determination of the bio-based content

Working Group 3 of the Technical Committee (TC) 411 of CEN has developed different standards for the measurement of the renewable content of biobased materials and, therefore, bioplastics.

The European norm **EN 16640** „Bio-based products – Determination of the bio-based carbon content of products using the radiocarbon method“, published in 2017, describes how to measure the carbon isotope C14 (radiocarbon method). Depending on the amount of bio-based carbon measured, certification will be carried out.³

In addition, the standard **EN 16785-1** „Bio-based products – Bio-based content – Part 1: Determination of the bio-based content using the radiocarbon analysis and elemental analysis“ has been developed to also account for other bio-based elements in a polymer through elemental analysis.

Part two of this standard **EN 16785-2** „Bio-based products – Bio-based content – Part 2: Determination of the bio-based content using the material balance method“, which is yet to be published, focuses on a material balance method to determine the renewable content of a bio-based product.

Labels referring to the bio-based content are for example DIN-Geprüft biobased, OK biobased (both offering different labels reflecting the product's share of bio-based content), and the new logo by Nederlandse Norm (NEN), based on EN 16785-1.



Sustainability and Life Cycle Assessment (LCA)

The two standards **ISO 14040** “Environmental management - Life cycle assessment - Principles and framework” and **ISO 14044** “Environmental management - Life cycle assessment - Requirements and guidelines” focus on describing the principles of life cycle assessment.

On the European level, Working Group 4 of CEN/TC 411 has developed the standard **EN 16760** “Bio-based products - Life Cycle Assessment”. It provides specific LCA requirements and guidance for bio-based products based on the ISO 14040 series.

Furthermore, standard **EN 16751** was developed to standardise sustainability criteria of bio-based products. However, it does not include any thresholds or limits and is not suitable for making claims on the sustainability of products or operations.

There are numerous certification schemes for the sustainability of biomass, for example ISCC PLUS, RSB (Roundtable on Sustainable Biomaterials), or REDcert. However, these are not based on a standard but on the provisions of the EU Directive 2009/28/EC (Renewable Energy Directive).



ISO 14067 is a standard on the “Carbon Footprint of Products”, providing detailed information on how to measure and report on the carbon footprint of products.

Biodegradation

Biodegradation is a chemical process in which materials are metabolised into water, carbon dioxide, and biomass with the help of microorganisms. The process of biodegradation depends on the environmental conditions, which influence it (e.g. temperature, inoculum, humidity, etc.) and on the material or application itself. To claim a product's biodegradability, the ambient conditions have to be specified and a timeframe for biodegradation must be set in order to make claims measurable and comparable. This is regulated in the applicable standards.

³ The US standard **ASTM D6866** “Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis” is also based on the radiocarbon method and has been used for bio-based content certification in Europe in the past years. The certification logo based on this standard in the US is the USDA BioPreferred label.

Relevant standards for biodegradable plastics

Standards for industrial composting and anaerobic digestion

The European standard **EN 13432** “Requirements for packaging recoverable through composting and biodegradation” requires at least 90% disintegration after twelve weeks, 90% biodegradation⁴ (CO₂ evolution) in six months, and includes tests on ecotoxicity and heavy metal content. It is the standard for biodegradable packaging designed for treatment in industrial composting facilities and anaerobic digestion.

Standard **EN 14995** describes the same requirements and tests, however it applies not only to packaging but plastics in general. The same holds for **ISO 18606** “Packaging and the environment – Organic Recycling” and **ISO 17088** “Specifications for compostable plastics”.^{5,6}

Labels for industrially compostable products are, for example, the Seedling Logo, OK Compost, and DIN-Geprüft Industrial Compostable.



Standards for oxo-degradable plastics

Oxo-degradable plastics are made of conventional plastics (e.g. PE or PP) supplemented with additives in order to mimic biodegradation. They cannot be considered as bioplastics and have failed to prove proper biodegradability in any environment. The standards that are claimed to confirm the biodegradability of such products, most notably the US standard ASTM D6954, do not provide pass/fail criteria, leaving these misleading claims wholly unsubstantiated.

Standards for home composting⁷

There is currently no international standard specifying the conditions for home composting of biodegradable plastics. However, there are several national standards, such as the Australian norm **AS 5810** “Biodegradable plastics – biodegradable plastics suitable for home composting”. Belgian certifier Vinçotte had developed the OK compost home certification scheme, requiring at least 90% degradation in 12 months at ambient temperature. Based on this scheme,

the French standard **NF T 51-800** “Plastics — Specifications for plastics suitable for home composting” was developed, specifying the very same requirements for certification.

Labels proving home compostability are OK compost Home and the DIN-Geprüft Home Compostable Mark.



Biodegradability in soil

The certification scheme “Bio products – degradation in soil” developed by Vinçotte is based on EN13432/EN14995 (Standards for the industrial composting of packaging/plastics) and adapted for the degradation in soil. The test demands at least 90% biodegradation in two years at ambient temperatures.⁸

The standard **EN 17033** “Biodegradable mulch films for use in agriculture and horticulture – Requirements and test methods” has not yet been published (expected in 2017) but will specify the requirements for biodegradable films, manufactured from thermoplastic materials, to be used for mulching applications in agriculture and horticulture, which are not intended to be removed. A degradation of at least 90% in two years at preferably 25°C will be required.

The label OK biodegradable Soil is certified by Vinçotte in case a product meets the requirement of their certification scheme. DIN CERTCO awards DIN-Geprüft biodegradable in soil in accordance with CEN/TR 15822.



Biodegradability in marine environments

Currently, there is no standard providing clear pass/fail criteria for the degradation of plastics in sea water. The US standard **ASTM D7081** “Standard Specification for Non-Floating Biodegradable Plastics in the Marine Environment”

⁴ Complete biodegradation of the plastic material has occurred when 90% or more of the original material has been converted to CO₂. The remaining share is converted into water and biomass, which no longer contains any plastic.

⁵ The US standard **ASTM D6400** “Specification for Labelling of Plastics Designed to be Aerobically Composted in Municipal or Industrial Facilities” is the US standard with clear pass/fail criteria. The corresponding label is the BPI Compostable in Industrial Facilities.

⁶ The Australian standard **AS 4736** “Biodegradable Plastics suitable for Composting and other microbial Treatment” additionally includes the so-called earthworm test. The Seedling Australia logo is certified according to this standard.

⁷ Home composting should only be considered as complementary to industrial composting. The latter represents the circular type of composting, generating secondary products and raw materials such as organic fertiliser or bio-waste as feedstock for industrial products. For more information please see the EUBP Position paper „Home composting of compostable bioplastics“ at www.european-bioplastics.org.

⁸ In the USA, the standard **ASTM 5988** describes a test method for determining the aerobic biodegradation of plastic materials in soil, without giving pass/fail criteria.

has been withdrawn without replacement. However, the test methods that were referred to are still in place, but do not offer any pass/fail criteria: **ASTM D6691** “Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in the Marine Environment by a Defined Microbial Consortium or Natural Sea Water Inoculum”, **ASTM D 6692** “Standard Test method for Determining the Biodegradability of Radiolabelled Polymeric Plastic Materials in Seawater” and **ASTM D7473** “Standard Test Method for Weight Attrition of Plastic Materials in the Marine Environment by Open System Aquarium Incubations”. Other standards on this issue are **OECD 306** “Biodegradability in sea water” and **ISO 16221** “Water quality – Guidance for determination of biodegradability in the marine environment”.

However, these standards are only guidelines and do not provide clear requirements for conditions and timeframes. Research and development is ongoing to develop harmonised standards for marine biodegradation, which are needed before relevant products can be introduced to the market. With research underway and standards and certified products likely to see the light of day in the near future, questions concerning the limitations for this technology need to be answered: In which context and for which products does this technology make sense and how can it complement a circular economy? Once these questions have been answered, sound communication and advertising rules need to be defined.

Vinçotte has developed a certification scheme based on ASTM D7081, which demands, in a simplified way, a biodegradation of at least 90% in 6 months. The corresponding label is OK biodegradable Marine.



Bioplastics – Communication standards

Working Group 5 of CEN/TC 411 has developed standards for the communication of bio-based products: **EN 16848** “Bio-based products - Requirements for Business to Business communication of characteristics using a Data Sheet”,

published in 2016, and **EN 16935** “Bio-based products - Requirements for Business-to-Consumer communication and claims”, which will be published in early 2017.

The **ISO 14020** series on “Environmental labels and declaration” is the main international guideline for “green claims”. Three different types of environmental labels and declarations are promoted in these standards. **ISO 14021** covers self-declared environmental claims, **ISO 14024** to environmental labelling, and **ISO 14025** to environmental declaration.

Also relevant in this field of standards is **ISO 14063** on “Environmental management – Environmental communication”, focussing on setting up communication procedures in companies and containing a general guidance on the basics of environmental communication. **ISO 14067** (see *Sustainability and Life Cycle Assessment*) also provides general guidelines on how to use carbon footprint claims correctly.

Conclusion

There are already numerous standards and test methods available, providing a normative framework for explaining the properties ‘bio-based’ and ‘biodegradable’ in connection with plastic materials and products. Claims about bio-based plastics and products can be substantiated in accordance with the requirements that the standards described above specify. Industrial composting (putting biodegradability to circular use) is well defined in the European Norm EN 13432. In terms of the circular economy, these standards offer a first basis for assessing bioplastics and providing sound communication on corresponding claims - a prerequisite for successful market performance. With regard to biodegradability in other environments than industrial composting, first national standards and test methods have been developed or will be underway once further necessary research has been carried out.