Biodegradable Polymers in Various Environments

According to Established Standards & Certification Schemes

Update 2026

NOTES

- proven biodegradability
- proven biodegradability for certain grades
- biodegradability not proven[1]

The biodegradability of plastics derived from these biodegradable polymers can only be guaranteed if all additives and (organic) fillers are biodegradable, too. Dying and finishing of cellulosic fibres, for example, may prevent their biodegradation in the environment.

Biodegradation depends on the complex biogeochemical conditions at each testing site (e.g. temperature, available nutrients and oxygen, microbial activity, etc.). Therefore, these generalised claims about biodegradability can only serve as approximations and need to be confirmed by standardised testing under lab conditions. In-situ behaviour can vary, depending on the mentioned conditions, size of the plastics parts, grade of the polymer and other factors. For instance, biodegradation testing is often performed after milling, showing the inherent nature of the material to biodegrade. In reality, the same level of biodegradation will be obtained, be it possibly within a different timeframe.

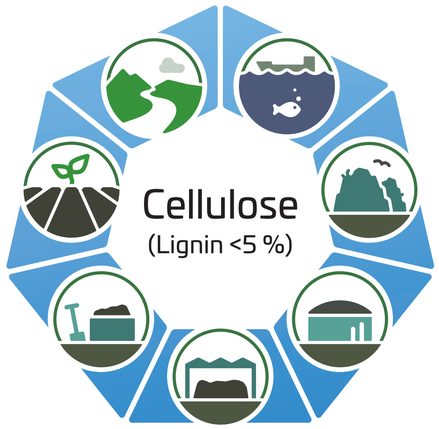
SLOWER BIODEGRADING POLYMERS

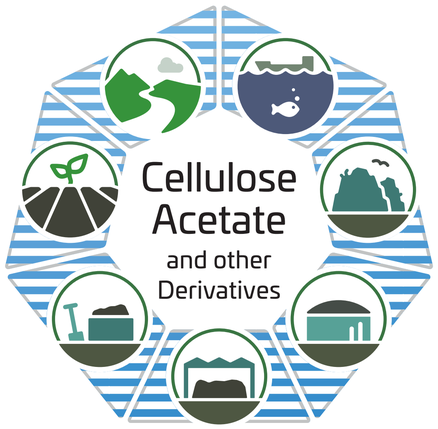
The polymers shown biodegrade rapidly in the specified environments within the timeframes set by relevant standards or certifications. Other materials, such as PBS or PLA in soil and lignin/wood in most environments, also biodegrade but much more slowly, often taking years to decades. In some applications, such as geotextiles or tree shelters, slower biodegradation is desirable to ensure functionality over several years before decay; however, no standards currently address such cases though work is underway to develop standards for long-term biodegradation. Recent studies show that PLA also degrades slowly but completely in the ocean. The exact timeframe still needs to be validated.

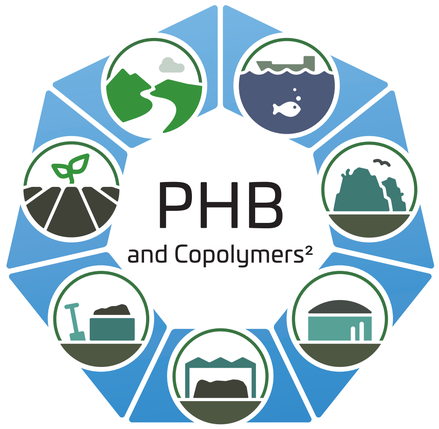
1 "Biodegradability not proven" can mean either there is a lack of data on biodegradability, or there is data that demonstrates non-biodegradability.

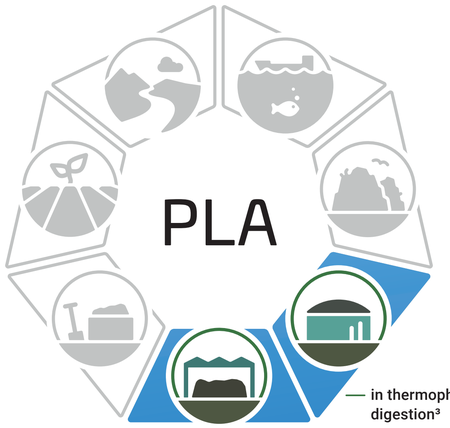
2 incl. P3HB, P4HB, P3HB4HB, P3HB3HV, P3HB3HV4HV, P3HB3Hx, P3HB3HO, P3HB3HD

3 PLA is likely to be biodegradable in thermophilic anaerobic digestion at temperatures of 52°C within the time frame mentioned in standards. This does not apply to mesophilic digestion.









— in thermophilic digestion³

ENVIRONMENTS

IMPORTANT TEST CONDITIONS, CERTIFICATION SCHEMES AND STANDARDS

For more details, refer to the original documents.

MARINE ENVIRONMENT

Temperature 30°C, 90 % biodegradation within a maximum of 6 months in seawater. Certification: TÜV AUSTRIA OK biodegradable MARINE, based on ASTM D6691.
Or temperature 15-25, max. 28°C, 90 % biodegradation within a maximum of 2 years, water and sediment tests allowed. Certification: DIN CERTCO DIN-Geprüft and DINplus biodegradable in marine environment, based on ISO 22403 and methods therein.

FRESH WATER

Temperature 21°C, 90 % biodegradation within a maximum of 56 days. Certification: TÜV AUSTRIA OK biodegradable WATER. Research on standards (especially on requirements) is on-going.

SOIL

Temperature 25°C, 90 % biodegradation within a maximum of 2 years. Certification: TÜV AUSTRIA OK biodegradable SOIL and DIN CERTCO DIN-Geprüft Biodegradable in Soil. DIN-Geprüft Biodegradable in Soil is based on the European standard 17033 for mulch films and/or ISO 23517 for mulch films and other products.

HOME COMPOSTING

Temperature 28°C, 90 % biodegradation within a maximum of 12 months. Certification: TÜV AUSTRIA OK compost HOME and DIN CERTCO DIN-Geprüft Home Compostable.

LANDFILL

No European standard specifications or certification scheme available since this is not a preferred end-of-life option for biodegradable waste.

ANAEROBIC DIGESTION

Thermophilic 52°C / Mesophilic 37°C
A specific European standard or certification scheme for anaerobic digestion is not yet available. Anaerobic digestion in a biogas plant is mentioned in EN 13432 and EN 14995: 50 % biodegradation within two months, usually followed by aerobic digestion.

INDUSTRIAL COMPOSTING

Temperature 58°C, 90 % biodegradation within a maximum of 6 months. Certification: TÜV AUSTRIA OK compost INDUSTRIAL, DIN CERTCO DIN-Geprüft Industrial Compostable and "Seedling". EN 13432 and EN 14995 are the European reference standards and the basis of these certification schemes. ISO 17088 is the international equivalent covering compostable plastics broadly.

RENEWABLE CARBON — More figures available at renewable-carbon.eu/graphics

Partners: HYDRA Marine Sciences · IKT Kunststoff Technik Stuttgart · Normec OWS · OK compost TÜV AUSTRIA · TÜVRheinland® DIN CERTCO · Wageningen University & Research · PerPlacsBio

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