Biodegradable Polymers in Various Environments

NOTES

proven biodegradability

proven biodegradability under certain conditions or for certain grades

biodegradability not proven

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.

Biodegradability 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 biodegradation 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 plastic, 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.

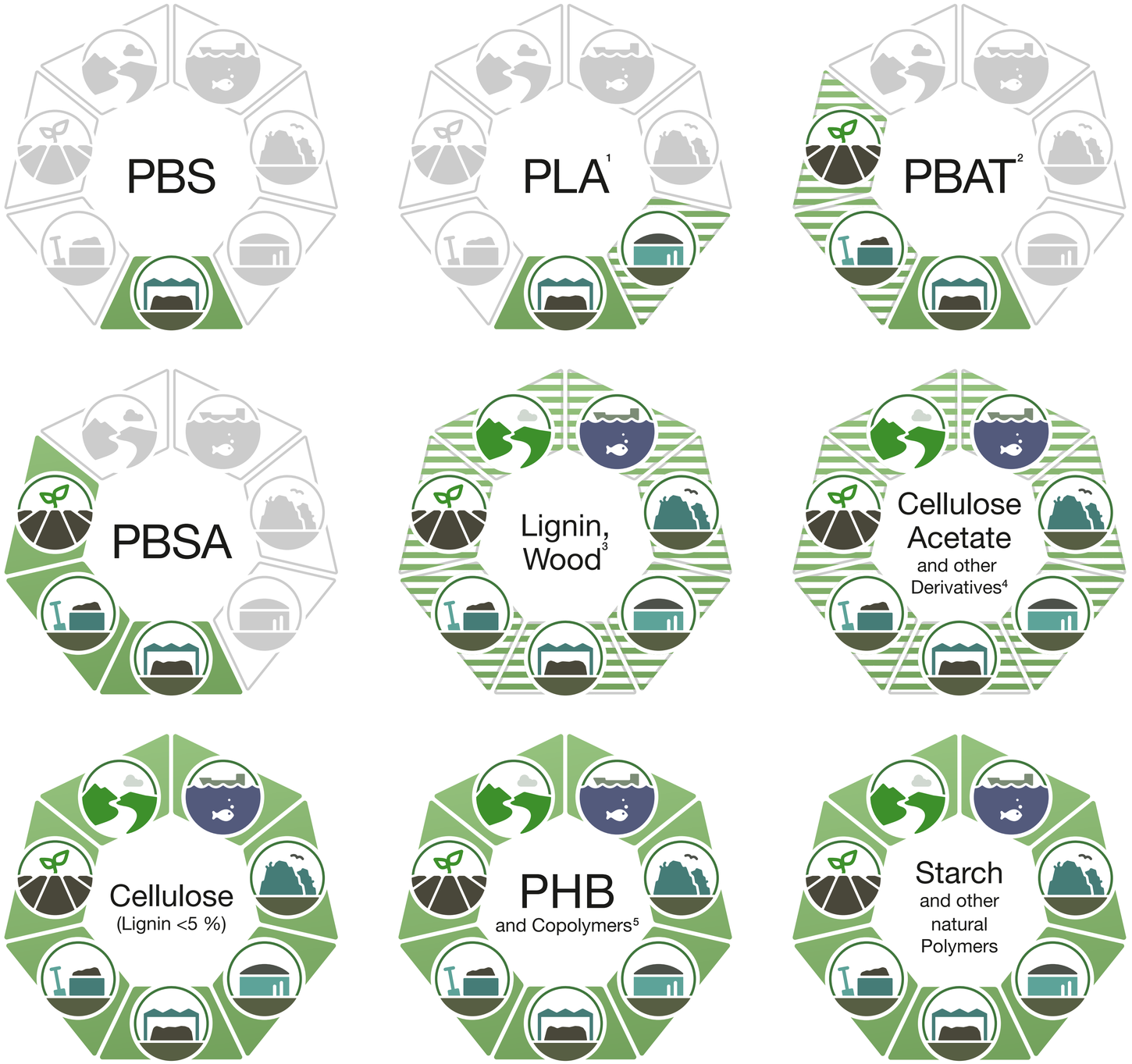
[1] PLA is only likely to be biodegradable in thermophilic anaerobic digestion at temperatures of 52°C.

[2] Biodegradability in home composting and in soil of PBAT is only proven for certain polymer grades.

[3] Complete biodegradation of materials with a high lignin content is not easily measurable with standard biodegradation tests, but does take place (slowly). Instead of CO_2, especially humus is produced by the biodegradation of lignin-rich materials.

[4] The biodegradation of CA in all environments is only proven for certain polymer grades.

[5] incl. P3HB, P4HB, P3HB4HB, P3HB3HV, P3HB3HV4HV, P3HB3Hx, P3HB3HO, P3HB3HD



ENVIRONMENTS

Details on test conditions and, if available, applicable pass/fail criteria.

MARINE ENVIRONMENT
Temperature 30°C, 90% biodegradation within a maximum of 6 months (Certification: TÜV AUSTRIA OK biodegradable MARINE (ISO under preparation))

FRESH WATER
Temperature 21°C, 90% biodegradation within a maximum of 56 days (Certification: TÜV AUSTRIA OK biodegradable WATER)

SOIL
Temperature 25°C, 90% biodegradation within a maximum of 2 years (Certification: TÜV AUSTRIA OK biodegradable SOIL; DIN Certco DIN-Geprüft biodegradable in soil)

HOME COMPOSTING
Temperature 28°C, 90% biodegradation within a maximum of 12 months (Certification: TÜV AUSTRIA OK compost HOME; DIN Certco DIN-Geprüft Home Compostable)

LANDFILL
No standard specifications or certification scheme available, since this is not a preferred end-of-life option

ANAEROBIC DIGESTION
Termophilic 52°C / mesophilic 37°C; standard specification not yet available, but 90% generally considered as completely biodegradable

INDUSTRIAL COMPOSTING
Temperature 58°C, 90% biodegradation within a maximum of 6 months (Standard: EN 13432)

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More figures available at **www.bio-based.eu/graphics**

Partners: IKT Kunststoff Technik Stuttgart; OWS; HYDRA Marine Sciences

Sponsors: TÜVRheinland® DIN CERTCO; OK compost TÜV AUSTRIA

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