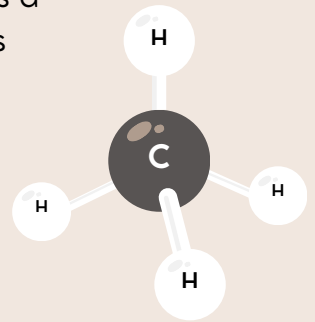


PHBV-POWDER



PHBV - TURNING METHANE INTO BIOPLASTICS

PHBV, Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) is a naturally occurring, non-toxic and biodegradable polymer that is formed as an energy storage compound by several microorganisms. PHBV has thermoplastic properties and can be used as a biobased alternative to conventional, non-degradable, fossil plastics. It is softer than PHB, the simplest and most common type of the material class PHA (polyhydroxyalkanoates). CIRCE is using the methanotrophic bacterium *Methylocystis* sp. GB25 that is able to metabolize CH_4 as sole carbon and energy source to produce PHBV by gas fermentation. Unlike sugar-based processes, gas fermentation can use a wide variety of biomass waste, offering a sustainable and scalable route to produce bulk materials like polymers.



WASTE DISPOSAL PATHWAY

PHBV is fully biodegradable under aerobic and anaerobic conditions, even in the marine environment, meaning it will biodegrade when littered without leaving persistent micro- and nanoplastics. It can also be mechanically recycled like other thermoplastics.



IMPACT

The hidden environmental and social costs of fossil plastics are estimated at about €15 per kilogram, 10 times more than the market price of virgin PE and PP. PHBV and other PHA cost more than PE and PP, but they do not come with a “hidden catch”. PHA can be considered the “gold standard” among bioplastics, with minimal environmental impact. Gas fermentation has a very low footprint in terms of land use, water and other resource consumption.



PHVB - POWDER

TARGET AUDIENCE

Compounders, who make formulations with PHBV, as main polymer or blend partner. Their customers can then make final products from the compounds, such as biodegradable films, paper coatings, or injection-moulded articles.



APPLICATION CASES

Products where biodegradability is the preferred end of life option, e.g. mulching film, paper coating, wrappings for candies, bite protection for trees, fibers to make strings for wine yards, plant pots, microbeads, etc.



COMPARISON OF THE INSPIRE PHA TO SIMILAR PRODUCTS

Unlike PLA, which is only industrially compostable, but neither home compostable nor degradable in water, PHBV offers superior biodegradability and the desired mechanical properties. Most PHAs on the market are produced from sugar fermentation. CIRCE's PHA is derived from CH₄ (biogas), making it a more sustainable option. CIRCE operates a pilot plant at the Technology Center Seestadt, where it can produce PHBV for sampling. The PHBV is characterized by high molecular weight with bimodal distribution, giving advantageous mechanical properties.

CONTRIBUTION TO THE INSPIRE PROJECT

The INSPIRE project, funded by the European Union's Horizon program, is a pioneering initiative aimed at contributing to the drastic reduction of litter, macro and microplastics in European rivers in a holistic approach by utilizing a series of detection, collection and prevention technologies and actions. This solution directly reduces microplastics accumulation in the environment by focusing on the root of the problem. Within INSPIRE, we are testing and developing PHBV for mulching film and paper coating. Learn more at <https://inspire-europe.org/>

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