



Bioplastics – revolutionising the lifecycle and sustainability of plastic

Bioplastics are plastics which are bio-based, biodegradable or both.

Bio-based plastics are produced from biomass, which helps to decrease our dependence on fossil carbon resources (the feedstock for conventional plastics).

They can offer a significant CO₂ emissions savings compared to conventional plastics. This is important for the health of our planet.

Biodegradable and compostable plastics, whether bio-based or conventional, are designed for specific applications and follow specific end-of-life management processes, where they are collected separately and organically recycled with bio-waste.

USING INDUSTRIAL BIOTECHNOLOGY TO CREATE BIOPLASTICS

Industrial biotechnology harnesses the power of naturally occurring microbes and enzymes to create and recycle bioplastics. Enzymes are nature's most powerful tool to catalyse (or speed up) chemical reactions.

Bio-based plastics can help reduce CO₂ emissions from plastics production. Instead of releasing historic carbon into the atmosphere through fossil fuel extraction and use, the carbon in bio-based products is the product of atmospheric CO₂ and water, transformed and stored in plants as the product of photosynthesis. When this biomass is then used to make bio-based products, the atmospheric CO₂ remains trapped in the products throughout their lifespan.

Bioplastics are available on an industrial scale. Manufacturers supply bioplastic resins to compounders and converters who produce everything from packaging products to automotive components, enabling brand-owners to increasingly meet consumer demand for more sustainable products.

BIO-BASED PLASTICS APPLICATIONS

Given their environmental profile and other benefits, bio-based plastics are now used in many traditional applications, including food service ware (like yoghurt pots, coffee cups and cutlery), packaging solutions (such as bags, paper coating, shrink films, and foam packaging) and injection moulding parts (like heat resistant under-the-hood parts in cars). For example:

Renewable car tyres

Over 1 billion tyres produced globally each year could be made from renewable carbon sources instead of fossil carbon.¹ Renewable resources can now be used to make durable, lightweight bio-based car plastics and tyres, which reduce fuel consumption and CO₂ emissions.

Recyclable plastic bottles

The use of innovative enzymes in the plastic recycling process makes de-polymerisation possible, by converting a single polymer (e.g. PET, the polymer most often used in plastic bottles) into monomers, which can be used in new products. Such innovative new solutions, enabled by industrial biotech, make it possible to endlessly recycle plastic waste.²

BIODEGRADABLE AND COMPOSTABLE PLASTICS APPLICATIONS

Biodegradability is an inherent feature of a material, which relates to the chemical structure of the polymer. Biodegradability defines the ability of the material to degrade in a controlled time-span, alongside organic waste. Bioplastics complying with standards such as EN13432 – which sets requirements and test methods to evaluate if a plastic is biodegradable and compostable – can be converted into compost without any negative impacts on the compost quality. There are several applications where biodegradability and compostability is an asset in order to improve waste management and recycling. These include:

Waste bags for the collection of bio-waste or single-use bags with short life (i.e. fruit and vegetables bags): Compostable plastic bags (usually containing poly lactic acid rather than polythene)

can be used multiple times as shopping bags. However, they have also been designed (in accordance with standards such as EN13432) to biodegrade along with other organic waste to form compost in industrial facilities. As a result, they offer a key advantage when it comes to organic waste in a domestic or industrial setting, because there is no need to laboriously remove the collection bags. Also, this secondary use reduces the number of plastic bags that become litter or end up in landfill.³

Biodegradable and compostable tableware (plates, cutlery, glasses, food packaging) used in fast-food restaurants, canteens, and large events, can be collected together with biodegradable waste (leftovers, expired food, etc.). The use of a biodegradable and compostable catering service allows, especially, in contexts in which the waste is managed in a “closed loop system” to collect mixed waste (organic waste and catering service) in a single flow of homogeneous waste, that then can be organically recycled in a composting facility.

Biodegradable and compostable coffee capsules and tea bags help to efficiently recycle organically the organic content (coffee or tea residues) and avoids confusion about the appropriate way of disposal as well as mishrows.

Biodegradable and compostable thin film applications for fruit & vegetable packaging: these applications can help to improve bio-waste management reducing plastic impurities that end up in composting facilities.

Biodegradeable agricultural mulch films, where the collection and recycling is difficult due to contamination with soil, sand and organic material, making the mechanical recycling economically unviable.

USING BIO-BASED SOLUTIONS TO RECYCLE CONVENTIONAL PLASTICS

Industrial biotechnology solutions also increasingly provide additional solutions for a more sustainable plastics industry and end of life management. Some conventional plastics are collected and industrially degraded back into feedstock using innovative enzymes. This avoids conventional thermo-chemical plastic recycling processes which are more resource intensive.



DID YOU KNOW?

- It takes just 1.6 kg of sugar to make 1 kg of bioplastic (PLA) resin.⁴
- Two thirds of Europe's plastic waste was incinerated or sent to landfill in 2014.⁵
- Industrial biotechnology makes it possible to endlessly recycle plastic waste.⁶

¹ Rubber Manufacturers Association

² See [Carbios' 'Biorecycling' webpage](#)

³ See e.g. [Novamont's 'Mater-Bi for shopping' brochure](#)

⁴ See [Total-Corbion's 'PLA bioplastics for a brighter future' brochure](#)

⁵ See [European Commission's 'Plastic Pollution' factsheet](#)

⁶ See [Carbios' 'Biorecycling' webpage](#)



The European Association for Bioindustries

EuropaBio, the European Association for Bioindustries

Avenue de l'Armée 6, 1040 Brussels, Belgium

t. +32 2 735 03 13 | f. +32 2 735 49 60

www.europabio.org



OCTOBER 2018