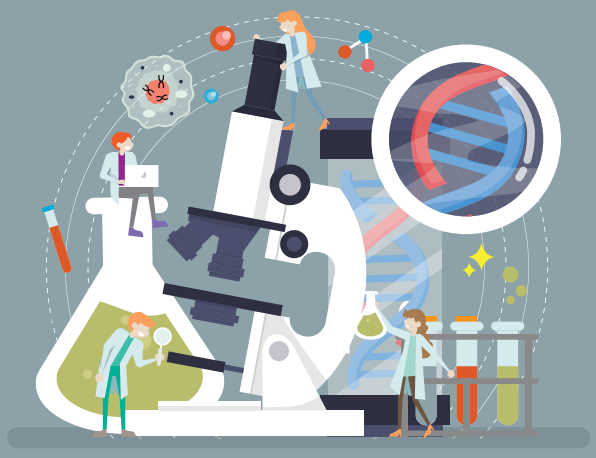
#InspiredByLife to

Create sustainable bio-based and biodegradable plastics

Over millennia, living organisms and biological systems in nature and the human body have developed a resourceful toolbox of biochemical capabilities, cellular and biomolecular processes and genetic resources. Inspired by a deeper understanding of these tools, life sciences researchers have studied nature to create new biotech solutions, in sectors including healthcare, agriculture and industry that help people and the planet.

Today, modern biotechnology provides breakthrough therapeutic treatments and biofortified nutrition that save lives and improve wellbeing. It enables new technologies that support a circular bio-economy, the European Green Deal and more sustainable agriculture that reduces the impact of human activity on our climate and ecosystems. It has inspired the development of new cutting-edge industrial manufacturing processes that are safer, cleaner and more efficient.



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 significant CO2 emissions savings compared to conventional plastics. Biodegradable and compostable plastics, complying with standards such as EN 13432[1] or NF T 51-800[2] also contribute to the circular economy, for example through improved end of life management (organic recycling) and applications which can help facilitate efforts to separately collect bio-waste and turning it into valuable resources.

Learning from living organisms and biological systems in nature

Industrial biotechnology harnesses the power of 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.

[1] European standard on the criteria for the industrial compostability of packaging.

[2] French standard on the criteria for home compostability of packaging.

Bioplastic applications in our everyday lives

Bioplastics are available on an industrial scale and are generating a leading share of direct employment in the industrial biotech sector in the EU.[3] 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.

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).

Some other examples of bioplastic applications that can be used in our daily lives, include:

- Renewable car tyres: 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.
- Home composting becoming possible with the introduction of innovative enzymes to accelerate the biodegradation of PLA.
- Compostable plastic bags, meaning that household waste can be directly composted without having to laboriously remove the collection bags, plus reducing the number of plastic bags that become litter or end up in landfill.
- 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, such as leftovers.

Did you know?

- It takes just 1.6 kg of sugar to make 1 kg of bioplastic (PLA) resin.[5]
- Two thirds of Europe's plastic waste was incinerated or sent to landfill in 2014.[6]

- Biodegradable and compostable coffee capsules and tea bags help to help to efficiently organically recycle the organic content, being the coffee or tea residues.
- Biodegradable and compostable packaging for fruit and vegetable packaging.

Reducing the impact of human activity on our climate and ecosystems

Bioplastics are an important ingredient 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.

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. Bio-waste could, in turn, be used for the production of high quality compost and organic fertiliser that helps restoring soil organic carbon and tackling desertification. Land degration is a recognised problem in Europe[4] with large territories, especially in Southern European countries, at risk. Bringing back carbon to the soil would help to combat desertification and climate change.

This case study including sources and references is available at https://www.europabio.org/inspiredbylife/case-studies

[3] **See report:** EuropaBio (2016) Jobs and Growth Generated by Industrial Biotechnology in Europe

[4] **See study:** R. Prăvălie, C. Patriche, G. Bandoca (2017) Quantification of land degradation sensitivity areas in Southern and Central Southeastern Europe

[5] **See brochure:** Total-Corbion (2019) PLA bioplastics for a brighter future

[6] **See European Commission's factsheet:** Plastic pollution – we can make things better

Sources:

- **EuropaBio (12/2018):** Bioplastics – revolutionising the lifecycle and sustainability of plastic
- **EuropaBio (2016):** Jobs and Growth Generated by Industrial Biotechnology in Europe
- **Carbios:** 'Biorecycling' webpage
- **Novamont (2015):** Mater-Bi for shopping – biodegradable and compostable carrying solutions
- **Total-Corbion (2019):** PLA bioplastics for a brighter future
- **Carbiolice:** 'Home composting' webpage
- **European Commission:** Plastic pollution – we can make things better

EuropaBio, the European Association for Bioindustries
Avenue des Arts 53, 1000 Brussels, Belgium
t. +32 2 735 03 13 | **f.** +32 2 735 49 60

www.europabio.org