

Using PHA materials to advance towards the Sustainable Development Goals

An opportunity to radically change our impact on the planet

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Peace and prosperity for people and planet, now and in the future. That were the goals set by the United Nations Members States in 2015 when they adopted the 2030 Agenda for Sustainable Development. At the core of this agenda are the 17 Sustainable Development Goals (SDGs) which form a critical and necessary call to action by many countries, NGOs, businesses and civil society. All actors united in a global partnership to end poverty, improve health and education, reduce inequality, but also to tackle climate change and preserve our oceans.

The mission of the Global Organization for PHA (GO!PHA) is to actively contribute to the 2030 Agenda, by focusing on the accelerated development and adoption of the natural, renewable and circular material family; Polyhydroxyalkanoate (PHA). Together with our members we form an action-oriented network that works towards the establishment of a circular economy and therewith contributing to the mitigation of global warming and avoiding plastics pollution. In doing so, we directly contribute to SDG 12 Responsible Consumption and Production, SDG 13 Climate Action, and SDG 14 Life Below Water.

Natural solutions and materials provide an opportunity to radically change our impact on the planet, without sacrificing quality of life. As such, microorganisms that have been around on earth for about 3.5 billion years, have the ability to convert different types of feedstocks into PHAs. These microorganisms store energy in their cell body in the form of PHA, similar to humans storing fat in the body. At an increasingly rapid pace, academics and corporates are finding new microbes that produce different types of PHA materials, which subsequently form the basis for application and product development. Currently, products made from PHA can replace a wide variety of products that are made from fossil-based plastics, one of the main contributors to the pollution of our oceans and atmosphere.

PHA and SDG 12 - Responsible Consumption and Production

This year, Earth Overshoot Day, the day on which we, as mankind, collectively consumed more of nature than our planet can renew in a single year fell on August 22. This means that for the rest of the year we are depleting the earth's reserves in a way that continues to have destructive impact on the planet. SDG 12 is therefore all about responsible consumption and production as it aims to decouple economic growth from environmental degradation. To achieve this we need to increase our resource efficiency by radically implementing all forms of recycling of the materials we use, closing the loop for waste streams and by implementing renewable or even regenerative feedstocks. In other words, we need to make the transition from a linear and extractive economy towards a regenerative circular economy.

PHAs are a key asset in this transformation as these materials can renew again and again;

- PHAs can be recycled, via mechanical recycling, chemical recycling, enzymatic recycling or biological recycling.
- PHAs can close the loop of many product value chains by consuming its waste streams. Especially for waste streams that have high contents of carbon, sugars and fats, such as waste water streams, plastic waste, organic waste and agricultural and food production waste.
- PHAs can be made from a wide variety of renewable feedstocks, such as vegetable oils and plant-based sugars. Additionally they can be made by greenhouse gases, such as methane and carbon dioxide.

Switching our production patterns to one in which waste and renewable feedstocks are used instead of finite resources would reduce the tremendous pressure on our earth and its resources.

PHA and SDG 13 - Climate Action

2020 is just two-hundredths of a degree cooler than 2016, the warmest year ever recorded. From January to August we saw record concentrations of CO₂, methane and nitrous oxide emissions in the atmosphere. The amount of Arctic sea ice was at a record low during the summer and for the first time since record began the sea ice had yet to start freezing by late October. As a result, weather patterns are changing, sea levels are rising, and weather events are becoming more extreme and severe. And not without consequences. Climate change affects every country and every person around the world. It disrupts economies and affects the health and wellbeing of all creatures on earth.

There are three ways in which PHAs contribute to lower greenhouse gas emissions:

- More than 99% of plastics are produced from chemicals derived from oil, natural gas and coal, most of which are non-renewable resources. If current trends continue, by 2050 the plastic industry could account for 20% of the world's total oil consumption. While increasing rapidly, still a fairly little amount of plastics is recycled and the majority ends up in landfills, in nature, or is incinerated. Research has demonstrated that burning plastic in incinerators creates the most CO₂ emissions among any plastic waste management method. PHAs are not made from fossil feedstocks and have therefore a considerably smaller climate footprint.
- PHA is made from renewable resources which capture CO₂ during their growth process. If a product made from PHA reaches its end-of-life it can be reused or recycled, but if this is not possible it could also be composted or biodegraded. In the case of incineration, composting or biodegradation, CO₂ will be emitted, which can be captured again by new crops used for PHA production.

Lastly, the carbon-capture industry is rapidly evolving. Already microorganisms have been found that can convert CO₂ into PHA, and the combination of both provides a unique opportunity to absorb large quantities of CO₂ in the future, while creating high value added materials.

PHA and SDG 14 - Life Below Water

Today, we face continuous deterioration of our water ecosystems owing to primarily plastics pollution. The harm caused by plastics has significant impact on biodiversity and human health. It's unbelievable how much plastic can be found on our beaches, inside wildlife and even in our drinking water. SDG 14 sets the target to improve the quality of life below water, among others by preventing and reducing marine pollution of all kinds by 2025. We urgently need to rethink the way we use and dispose plastics, but we also need to explore plastic alternatives that can be consumed by nature in case it ends up in the environment.

Where fossil-based plastics can remain in the environment for more than a 1000 years, PHAs are marine degradable, providing nutrition to bacteria living in the sea or on land. By way of explanation, living organisms like bacteria and fungi feed on nutritious materials, so when materials end up on land or in water streams they should be able to be consumed by nature. There are several polymers that biodegrade on land, but the number of polymers that also biodegrade in sweet and salt water is very limited. PHAs that are currently produced on industrial scale meet this crucial requirement.

Products made from PHA that do not end up in waste collection infrastructures, but rather end up in rivers and oceans by accident, biodegrade safely, which also means that these products do not contribute to releasing toxic microplastics into the environment. This, however, should in no way be a ticket to littering and is rather a fail-safe, as in the first place PHA articles should be reused, recycled or composted.

Join our programs.

At **GO!PHA** we support natural alternatives to our need for plastic-like materials and we believe PHA deserves a prominent role in our future regenerative, renewable, bio-based and circular product ecosystems.

For this purpose **GO!PHA** has started the following programs:

- PHA is Natural. An elaborate program to create community data about PHA's fundamental natural properties, such as its occurrence in nature, its production process that mimics nature, and its diverse set of end-of-life options.
- PHA Demonstration Projects. A set of application development projects that showcase the potential of using PHA in new areas, from films, to foams, to textile fibers.

Join our mission.

Membership of **GO!PHA** is open to all companies, academia, investors, non-profits, and other entities actively engaged in the design, development, production, and adoption of natural solutions or specifically PHA polymers. This includes organisations that have a broader interest in renewable, durable and/or biodegradable plastics, mitigating global warming, enhancing the circular economy or reducing plastics pollution.



GO!PHA

Global Organization for PHA

The Global Organization for PHA is a member-driven, non-profit initiative to accelerate the development of the PHA-platform industry. Polyhydroxyalkanoate polymers (PHAs) provide a unique opportunity as a solution for reducing greenhouse gases and environmental plastics pollution, and establishing a circular economy, by offering a range of sustainable, high-quality and natural products and materials based on renewable feedstocks and offering diverse end-of-life options.

Become a member or sponsor to start sharing, contributing and collaborating to accelerate the PHA-platform industry.

www.gopha.org