

Factsheet: Raw materials of the "PHAt" project

The partners in the PHAt project are working on a sustainable solution for thickeners and binders in lubricants and solid film lubricants. It is therefore important for them to use bio-based and biodegradable raw materials as basis for material development. The partners have selected biotechnologically produced polyhydroxyalkanoates (PHAs) as raw materials for the innovative thickeners and binders. These biopolymers receive special attention because they are biodegradable and therefore extremely environmentally friendly.

Production of polyhydroxyalkanoates (PHAs)

Some bacterial species are able to produce different PHAs. An important representative of this polymer class is the so-called polyhydroxybutyrate (PHB). This polymer is formed during the energy metabolism of the bacteria and stored in the cell in the form of granules. PHB is therefore present as a kind of energy storage in all bacterial cells and, depending on the bacterial strain, accounts for up to 80 percent of the cell mass. To specifically produce PHB, a suitable bacterial strain is cultivated in a fermenter. A defined carbon source as well as an optimal mixture of nutrients promotes the highest possible bacterial growth. As soon as a bacterial culture has grown sufficiently, certain nutrients are removed from the culture, which intensifies PHB formation in the bacteria. In this artificially caused deficiency situation, the bacteria store PHB in their cells in order to make the best possible use of the remaining carbon source. The enriched PHB is then extracted from the bacteria. This method produces bio-based polymers with an excellent CO₂ balance (see Figures 1 and 2).

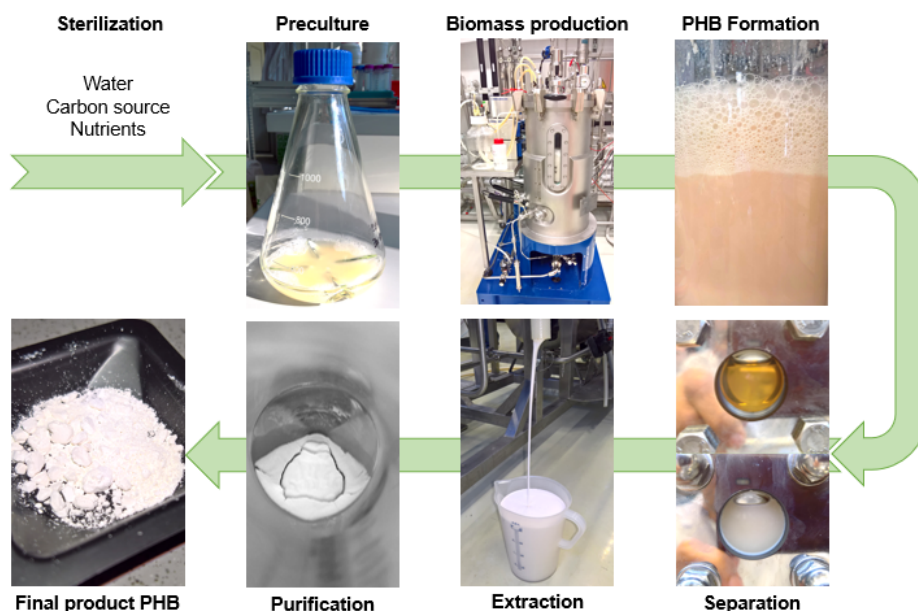


Figure 1: The PHB production process. © Fritzmeier Umwelttechnik GmbH

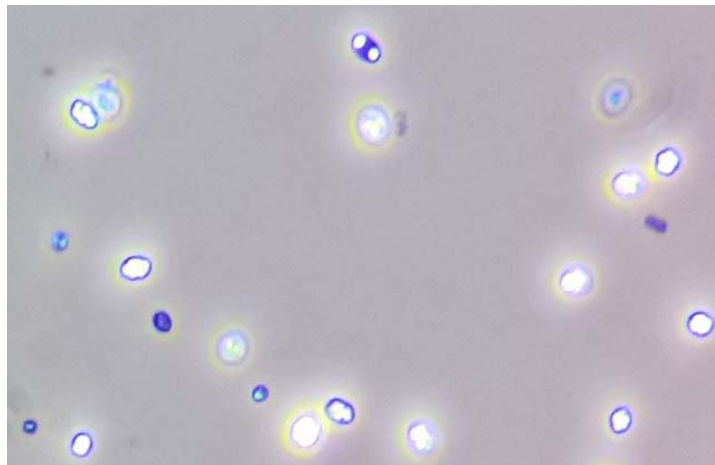


Figure 2: PHB granules in a bacterial cell.
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Modification of polyhydroxyalkanoates

The PHA obtained can be chemically modified for various applications in order to optimize their thickening and cross-linking properties. For example, it is possible to produce so-called PHA-based polyester urethane by a multi-stage reaction of PHA with diols and isocyanates. This significantly expands the range of properties of the original substance. These and other chemical modifications change the properties of the biopolymers and consequently of the materials in which they are used. This is also a challenge in the PHAt project, as different properties are to be optimized simultaneously. This results in innovative and environmentally compatible raw materials for the lubricants industry.

Development of lubricant formulations

Modern lubricants are high-performance products that are specially formulated for their respective field of application. The modified PHAs therefore still have to be tested in various areas. The aim is to find suitable lubricant formulations that are optimized for the respective application, whether in tractors or wind turbines.



New raw materials for environmentally friendly lubricants

Boilerplate for press releases

The „PHAt“ project

The goal of the PHAt project is the investigation of new bio-based and biodegradable raw materials for use in technical lubricants and solid film lubricants. Especially, the project focusses on the development of environmentally friendly thickeners. The research consortium comprises expertise from industry and academia. They address the question whether bio-based and at the same time biodegradable polymers, so called polyhydroxyalkanoates (PHAs), are suitable as thickeners. Thus, they can be used as an alternative to petroleum-based products in the future. The project is being funded by the Federal Ministry of Education and Research with approx. 1.25 million euros for three years. <https://phat-projekt.de/?lang=en>.

Project partners: Fraunhofer UMSICHT, Fritzmeier Umwelttechnik GmbH & Co. KG, FUCHS SCHMIERSTOFFE GmbH in cooperation with FUCHS LUBRITECH GmbH, UnaveraChemLab GmbH

Industrial Biotechnology Bayern Netzwerk GmbH

The Industrial Biotechnology Bayern Network GmbH (IBB Network GmbH) is a network and service organization in the field of industrial biotechnology and sustainable economics. The aim is to catalyze the implementation of valuable scientific knowledge in these fields into innovative, marketable products as well as processes. As a subcontractor, IBB Netzwerk GmbH is responsible for the dissemination of the results of the project. This is achieved by a project website, updates in social media, newsletters and press releases. Furthermore, the organization of project meetings is supported. The company is located in Martinsried near Munich. Further information can be found at: <https://www.ibbnetzwerk-gmbh.com/en/home/>.

Press releases

Please find all press releases and further information at: <https://phat-projekt.de/press/?lang=en>.

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