New catalysts for the production of superior PHB

The innovation includes new catalysts for the chemical synthesis of isotactic-enriched poly(3-hydroxybutyrate) (PHB). The catalysts are highly effective
and can be formed in situ, and the polymerization process uses cheap, racemic ß-butyrolactone as a starting material. Catalysts and polymerization conditions can be tuned to obtain PHB with varying degrees of isotacticity, eventually corresponding to fine-tuned material properties.

IP RIGHTS

European Application filed

2022

Material properties like petrochemical PP

The inventive PHB is based on cheap reactands and shows much improved material properties similar to petrochemical polypropylene (PP). Challenges encountered with bacterial PHB such as brittleness and low thermostability during melt processing are overcome by the inventive synthetic PHB.

01 Biocompatible and biodegradable plastic with superior material properties compared to bacterial PHB
02 Cost-effective production via ring opening polymerization of ß-butyrolactone
03 Thermomechanical properties similar to petrochemical PP, material suitable for melt processing
04 IP covers inventive catalysts, process for its synthesis, and polymer material
05 International PCT patent application planned for 2023

REFERENCES:

Link zum Download

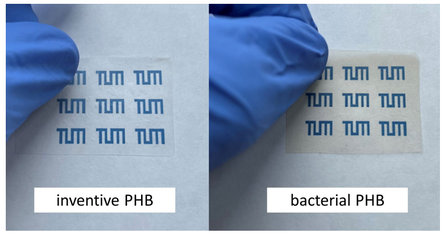


Figure 1: Comparison of polymer films produced with inventive synthetic vs. bacterial PHB. While the inventive PHB is clear, colorless and ductile, bacterial PHB is brownish and very brittle.

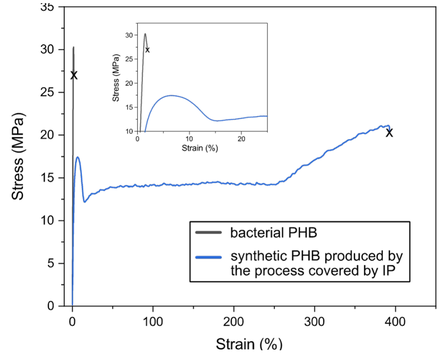


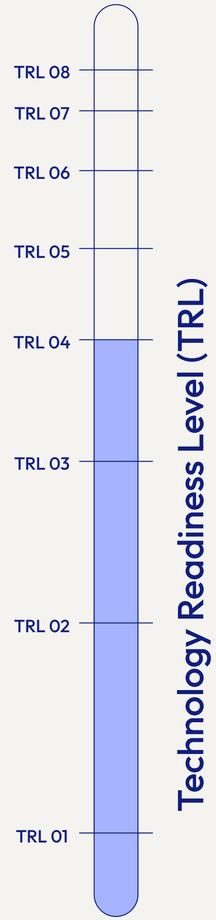
Figure 2: Stress-strain curves of bacterial PHB and inventive synthetic PHB, highlighting the highly improved polyolefin-like material properties of the inventive synthetic PHB.

CHALLENGE

Poly(3-hydroxybutyrate) is a biocompatible and biodegradable thermoplastic polyester that can be produced from renewable starting materials. However, pure isotactic PHB produced by fermentation processes has a very limited application potential since it is very brittle and difficult to process. Improved material characteristics similar to those of well-established petrochemical plastics such as polypropylene are essential for competitiveness of PHB bioplastics.

INNOVATION

The inventive PHB is, in comparison to bacterial PHB, favorably characterized by a high ductility and a lowered melting point enabling melt processing. It is clear and colorless, so that attractive optics can be achieved including transparency and light or bright colors after dyeing. The inventive PHB also lends itself to chemical recycling into the monomers, enabling circular polymer economy approaches. Based on its properties and cost-effectiveness the inventive PHB is ideal for packaging solutions and as a substitute for e.g. polyolefins in various applications. Samples are available.



01 Basic principles observed · **02** Technology concept formulated · **03** Experimental proof of concept · **04** Technology validated in lab · **05** Technology validated in relevant environment · **06** Technology demonstrated in relevant environment · **07** System prototype demonstration in operational environment · **08** System complete and qualified

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Bayerische Patentallianz GmbH
Dr. Rebecca Kohler
rkohler@baypat.de
+49 89 5480 117-33
Prinzregentenstr. 52
80538 München