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Polyhydroxyalkanoate production from wastewater

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Wastewate Anaerobic volatile fatty acid production 2 Photobioreactors a) DSP PHBV

INCOVER

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Polyhydroxyalkanoates (PHAs) are biopolymers that can be synthesized and internally accumulated by diverse microorganisms. PHAs are incorporated into plastic formulations with **reduced carbon** footprint and improved biodegradability.

The **INCOVER collaborative project** aims to optimize existing algae production infrastructure for PHA production from wastewater using photosynthetic mixed cultures through enrichment in PHA-producing photosynthetic purple bacteria. Mixed cultures to produce PHAs from wastewater provide low cost production systems yielding co-polymers with useful mechanical properties.

However, the challenges involved in the purification of the PHA from such a complex mix are significant. Biotrend is currently developing simple, low-cost and environmentally friendly processes, that can be easily plugged in existing wastewater treatment plants, for the purification of PHAs with different specifications.



1) Photo bioreactors enriched with PHA-accumulating purple bacteria.

- a) PBR operated under permanent carbon feast and simulating a high-rate algal pond (HRAP) with low sun exposure and anaerobic conditions.
- b) Feast and famine operation and simulating a paddle wheel HRAP. Reactors operated with temperature and illumination simulating average summer conditions.

2) Microscope image of the culture.

- a) Bright field;
- b) Fluorescence image of Nile blue staining indicating PHA granules.

3) Pilot plant ponds:

- a) Conventional HRAP
- b) PBR with PHA-accumulating purple bacteria





PHA-accumulating photosynthetic purple bacteria were An aqueous PHA extraction method was developed to provide a polymer with commercial specifications. selected and used in industry-relevant conditions.



Results

4) PHA extraction form the bacterial biomass

a) Using proprietary aqueousbased process, the biomass components are digested and washed out.

b) Water removal and drying to obtain PHA powder with high purity.

5) Polymer formulation and pelletizing

- a) The polymer powder is mixed with customary processing aids and added to the hopper of an extruder.
- b) A PHA filament is obtained.
- c) PHA pellets are produced form the PHA filament.



Conclusions