

Oceanus Biopolymers

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OCEANUS BIOPOLYMERS

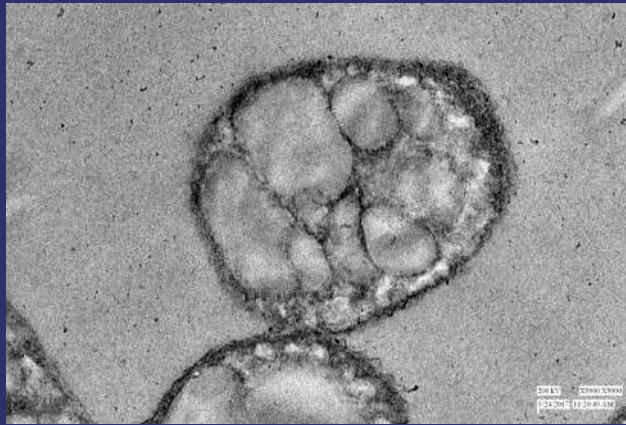
ABOUT US

Oceanus Biopolymers, established in December 2020 focuses on developing and manufacturing biodegradable plastics from marine biological systems. The company is currently associated with CUSAT-TBI under Centre for Innovation, Technology Transfer & Industry Collaboration (CITTIC) and is incubated at National Centre for Aquatic Animal Health, Cochin University of Science and Technology. Immediate focus of the company is a completely biodegradable bioplastic Polyhydroxyalkanoates (PHAs).

WHAT ARE PHAS?

PHAs are a group of over 150 known polymers mostly of bacterial origin, differing in the functional groups and varying properties. The polymer discovered in late 1920's and commercialized in 1980s did not succeed in the market due to its high cost of production. Polyhydroxyalkanoates accounts for mere 1.2% of global bioplastic production of 2.11 million tonnes compared to the global plastic production of 359 million metric tonnes in 2018.

Under stressed conditions such as nutrient limitation, oxygen deficiency specific bacteria store the excess carbon available in its microenvironment as PHA granules. These polymer granules are inert, hydrophobic in nature and can constitute up to 90% of the cell space. These granules can be extracted from the bacterial cells using solvents and the dried material has properties similar to that of polypropylene.



Electron micrographic image of *Vibrio* sp. MCCB 290 containing PHA polymer granules

BIODEGRADABILITY

The polymer can be hydrolytically biodegraded without any toxic by-products. PHB can be easily degraded into carbon dioxide and water by microbial activity. During in vivo medical applications, the degradation product formed is a normal blood constituent, 3-hydroxybutyric acid. The unique properties such as bio-compatibility, bio-resorbability, bio-degradability, mechanical strength, and processibility make them a suitable candidate for biomedical applications, in addition to those of environmental and aquaculture

WHAT WE DO?

We have several marine microbial isolates from West Coast of India with commendable PHA production. Less expensive substrates from industrial processes such as agro residues or industrial byproducts such as glycerol could be utilized as the carbon sources for reducing the cost of production, the primary objective of the company. We are currently working on product development, and scaling up and improvement of extraction processes.



Polyhydroxybutyrate flakes extracted from *Vibrio* sp. MCCB290

POSSIBLE APPLICATIONS OF PHA

Several formulations of PHAs have been identified, such as PHB sheets for early cancer detection, bone scaffolds, cartilage repair, injectable microparticle based scaffolds for regeneration of complexly shaped tissues, preparation of micro- and nano-sized carriers with therapeutic drugs to target tissues, development of antigen carrying particulate vaccines and sustained drug release stents. They find applications in other sectors as well such as packaging and different areas of agriculture and aquaculture. However, their higher cost of production hinders their utility in such fields.

OUR FUNDING

We have received Start up funds Rashtriya Uchchattar Shiksha Abhiyan (RUSA), Incubation and Instrumentation facility from National Centre for Aquatic Animal Health and Centre for Innovation, Technology Transfer & Industry Collaboration (CITTIC), Cochin University of Science and Technology (CUSAT), Kochi.