ISSUE 7 · FEBRUARY 2024

catchgreen

Powered by Biodolomer®

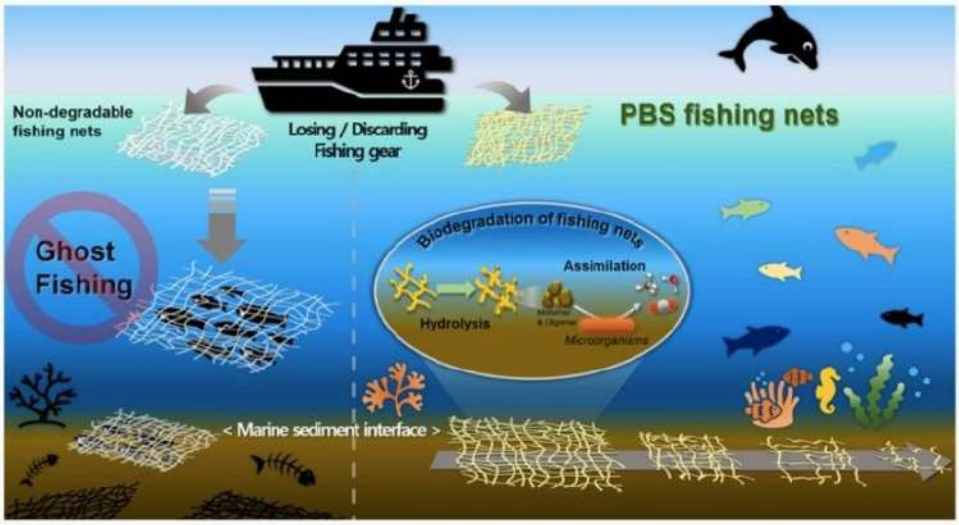
Newsletter of the Catchgreen project on biodegradable fishing gear

Biodolomer®Ocean

PBS-BASED BIODEGRADABLE POLYMER FOR MARINE APPLICATIONS

Catchgreen, in collaboration with GAIA Biomaterials, has developed the PBS-based biodegradable polymer Biodolomer®Ocean. This polymer is being trialed, as a spun rope, as a replacement for traditional HDPE fishing gear to reduce the negative impacts of ALDFG or "ghost fishing" by creating gear that will be metabolized into harmless biomass at its end-of-life.

PBS has been shown to biodegrade into water and carbon in multiple environments, including compost and marine sludge sediments. This occurs in a two-step process whereby hydrolysis on the surface removes monomers and oligomers, which then metabolize in a reaction that is catalyzed by the naturally occurring enzyme PBSase.



Source Kim et.al. Polymer Degradation and Stability (2023)

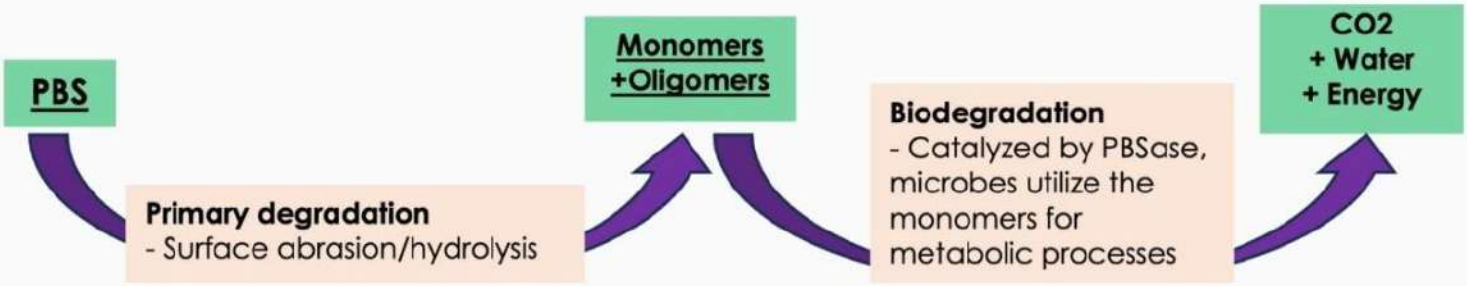
Why PBS?

PBS has a balanced range of properties well-suited for marine applications.

PBS is marginally denser than conventional polymers, meaning that products (nets) derived from PBS will sink, removing their ghost-fishing potential and delivering them to microbe-rich ocean sediments.

PBS is a promising aliphatic polymer that can naturally biodegrade through digestion by microbes found in the ocean.

PBS can be produced from renewable monomer sources such as corn and sugarcane.

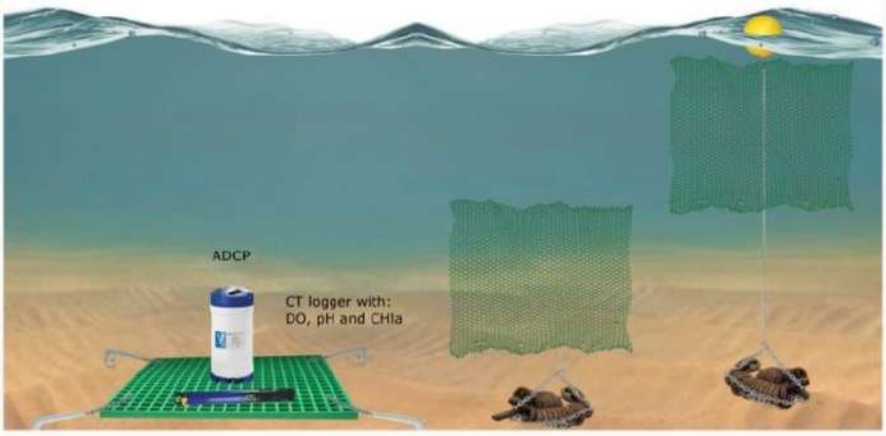


Polybutylene succinate (PBS)

BIODEGRADATION PROCESS

PBS (and other environmentally biodegradable plastics) are broken down by a two-phased process. Initially, mechanical wear (hydrolysis) causes lower molecules (monomers and oligomers) to be shed from the surface of the PBS. The inside of the material maintains its crystallinity and strength whilst the surface changes at a rate determined by environmental conditions including abrasion, temperature, and UV exposure. These lower molecular species shed from the surface are then broken down into CO2 and water by microorganisms and the enzyme PBSase. Soil, compost, and marine sediment all have higher concentrations of these microorganisms than seawater, meaning the bulk of the degradation process may be limited whilst a PBS-based polymer is in use, and accelerated when it reaches sediment.

Norwegian-based SINTEF has been contracted to test Biodolomer®Ocean for degradation and loss of tensile properties. SINTEF uses different analytical tools to determine primary and secondary degradation in cold seawater.



Source CLS Group

SINTEF

Previous research on PBS-based fishing gear has shown degradation after approximately 24 months and some loss in fishing efficiency after heavy use. Catchgreen is focused on overcoming these efficiency losses through selective replacement of net parts and application-tailored formulas.

Preliminary laboratory testing of Biodolomer®Ocean by SINTEF is promising and indicates early stages of degradation and small losses in tensile strength. Catchgreen is in the planning phase of the at-sea deployment of experimental seabed grates and nets to test the biodegradability of the nets in real-life conditions and different sea temperatures.

Foreign, Commonwealth & Development Office
UNITED NATIONS UNCTAD
SIMEP
THANK YOU TO EVERYONE WHO PARTICIPATE IN THESE TRIALS