ISSUE 10 · MAY 2024

catchgreen

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Newsletter for Catchgreen project on biodegradable fishing gear

Nordic Bioplastic Conference

SHOWCASING THE LATEST INNOVATIONS IN BIOBASED AND BIODEGRADABLE PLASTICS

The Nordic Bioplastic Conference 2024 brought together experts from the entire bioplastics value chain to update the industry on developments within the field. The event featured industry case studies and market and application overviews with input from experts, policymakers, and consultants. GAIA Biomaterials had been invited to the Conference to present their last development in the R&D of Biodolomer®Ocean. GAIA Biomaterials, with its plant and head office in Helsingborg, Sweden manufactures biodegradable compounds that can be used with almost all traditional plastic production methods, from film blowing to 3D-printing. Its latest innovation Biodolomer®Ocean is a biodegradable biopolymer that aims to replace harmful plastics in the fishing industry.

PBS, a good start

GAIA Biomaterials uses Polybutylene succinate (PBS) as the binder in Biodolomer®Ocean. PBS is a softish biodegradable material with bio-based content ranging from 0-100% and physical properties analogous to high-density polyethylene (HDPE).

PBS has been shown to biodegrade into water and carbon in multiple environments, including compost and marine sludge/sediment.

The biodegradation takes place in a two-stepped process where the hydrolysis on the surface of the material removes monomers/oligomers which then metabolize in a reaction that is catalyzed by the naturally occurring enzyme PBSase.

Previous research shows degradation within 24 months.

Biodegradation testing

BIODEGRADABLE MONOFILAMENT

Although there is strong science on the breakdown of PBS in nature, we are not working with a pure PBS and every additional copolymer or additive will have some effect on the rate and method of degradation. While we know that BiodolomerOcean can and will biodegrade, questions regarding its useful lifespan and rate of degradation are still to be answered precisely.

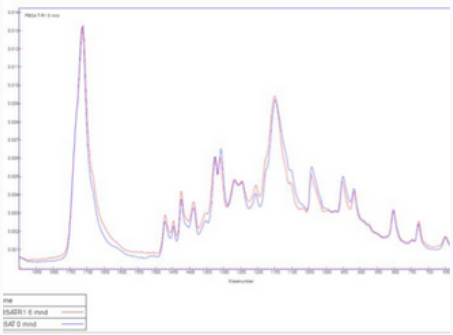
Four different grades are currently being tested for degradation and loss of tensile properties by SINTEF in Norway, using different analytical tools.

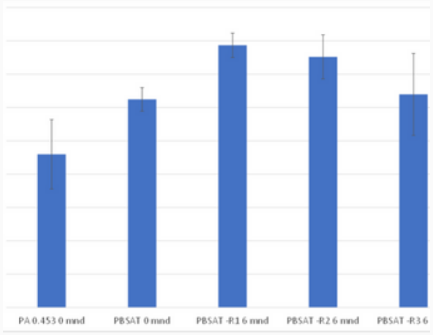
Preliminary sampling of BiodolomerOcean after 6 months in marine sediment shows the material has not started the accelerated biodegradation process and that it remains intact both visibly, chemically, and mechanically.

These findings are good for the project as they imply that the material does not suffer a quick breakdown of the mechanical properties and that the material stands a chance to continue to perform in marine environments within the work-life needed by the industry.

The biodegradation testing at SINTEF will continue for another 24 months to monitor if microbes have started to assemble on the surface of the filament and have begun to compromise the material properties.

Plans are also in place to extend the laboratory tests to biodegradation testing after at-sea deployment of the material. This will provide us with direct proof of microbial bond breaking or de-polymerization in natural marine systems





Test results after 6 months in marine sediments

FTIR testing shows that there has been some loss of surface material and a small reduction in tensile strength. This primary degradation is likely a result of the removal of lower molecular species from the surface as predicted, potentially due to hydrolysis. This is indicated by a shift in the carbonyl peaks from 1715cm-1 to 1711cm-1 in some of our grades. The surface roughness has also increased slightly in at least two of the samples. This may be indicative of biodegradation, in line with previous research that has demonstrated slow biodegradation of a PBS-PBAT blend in cold seawater.

SEM analysis of the samples shows that the roughness of the surface area of the samples has not increased after 6 months. This also tells us that the material remains intact.

The result after tensile testing indicate that the mechanical properties of the samples remain the same and that the material does not suffer a quick breakdown of the machanical properties.

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THANK YOU TO EVERYONE WHO PARTICIPATE IN THESE TRIALS