Cluster 4. Functional Materials project A17020 Biodegradable nanocomposite packaging materials
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4.15

The Perfect Package

Nanoparticles to improve bioplastics

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Challenge

Plastic waste is a great problem and it is predicted that 1 trillion tons will come from food and drink packaging by 2020. Especially petrol-based plastics are problematic as they are non-renewable and non-biodegradable. Biodegradable alternatives exist but their properties need to be improved to make them suitable for the food industry.

Solution

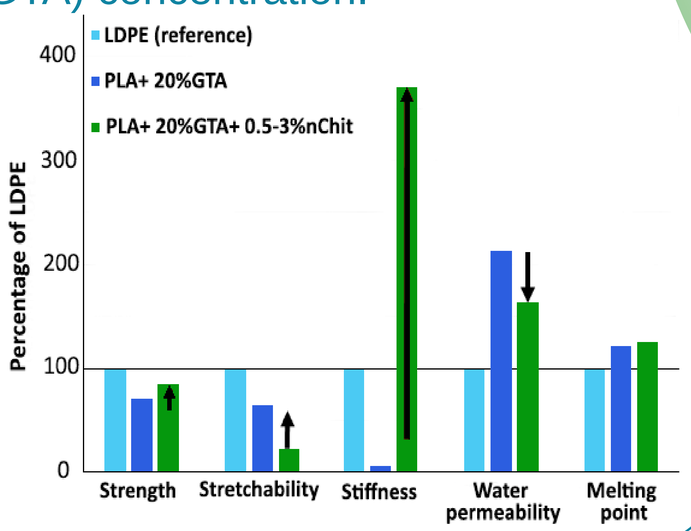
Nano fillers have shown to improve polymer properties. In the current project, it is aimed to improve the properties of the bioplastic poly lactic acid (PLA) by the incorporation of chitin nanoparticles (CNP).

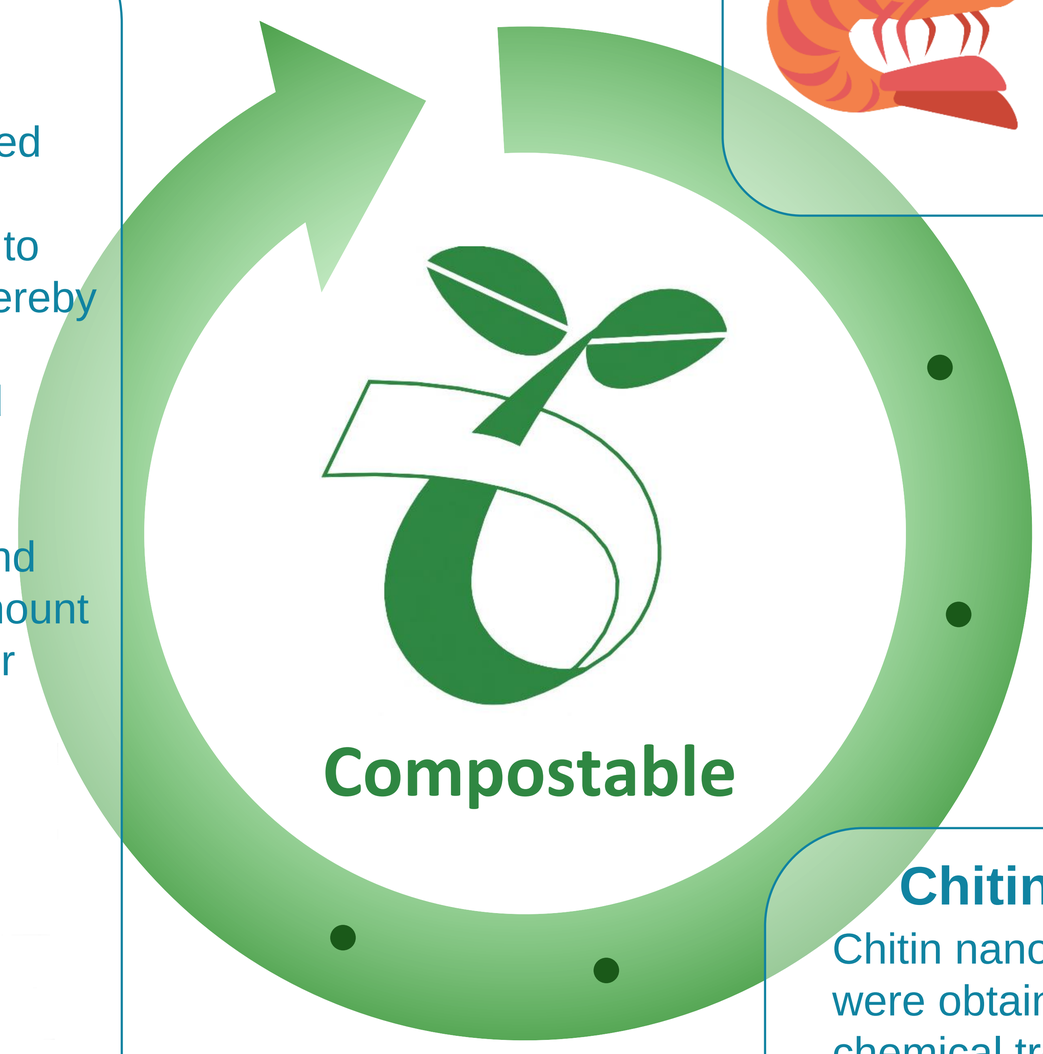
Starting with Chitin

Chitin is an abundant natural and biodegradable polymer present in e.g. crustacean shells, making it a perfect candidate for film reinforcement.

Better properties compared to industrial LPDE

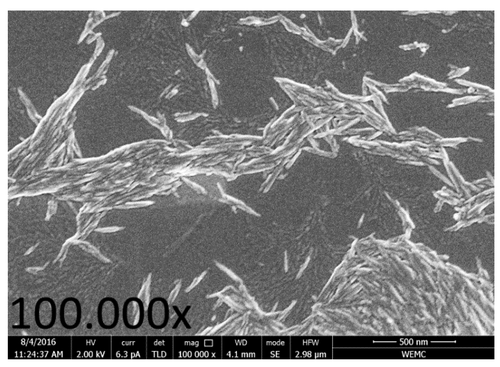
The incorporation of chitin nanoparticles successfully improved film properties. The water vapour permeability was lower compared to industrial standard LDPE films, thereby enhancing barrier properties. Also increased UV-blockage was found which could potentially protect products vulnerable for photo-oxidation. The film stretchability and stiffness could be tuned by the amount of nanoparticles and the plasticizer (GTA) concentration.





Chitin Nano Particles (CNP)

Chitin nanoparticles were obtained after chemical treatment. This SEM image shows a homogeneous dispersion of CNPs at 100.000x magnification.



Future

Our package showed interesting properties when compared to LDPE, and may be variable alternative for conventional petrol-based plastics. Successful production was possible at pilot plant scale and is most probably relatively easy to scale up. It is expected that the composite films can be made at low additional costs that are well within the price range consumers are willing to pay. Further investigations will allow us to conclude whether our concept brings us one step closer to a more sustainable food package future.

Project progress (in years):

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