

Enzymatically remodelled carbohydrates for personal & home care products

Publieke samenvatting / Public summary

Aanleiding

Most of the polymers dominating the personal care industry are of synthetic origin which play an important role as an emulsifier, rheology modifier, thickener, conditioning agent, and delivery system in the personal and home care industry. Large quantities of these non-biodegradable synthetic polymers are disposed after usage via the wastewater in our natural environment. The urgent need to tackle this global pollution problem has resulted in a call from the European parliament for a ban on specifically non-soluble microplastics in cosmetics by 2020. The water-soluble synthetic polymers (WSP) have been excluded from this as these, for a long time, were considered to have a low ecotoxicological profile although they are not biodegradable either. More and more, scientific studies point out to the opposite, and it is foreseen that these will cause similar critical environmental implications as the solid ones (plastics). It might even become a bigger problem as the microplastics as a fivefold of these WSP are used. Growing awareness of this ecological problem is urging home and personal care industry to search for alternative and biobased solutions.

Doelstelling

The main objective of this project is exploring and to develop a novel biocatalytic process for making biobased alternatives for the currently used water soluble fossil based and non-biodegradable polymers in personal and home care products. Specifically, we want to replace o water soluble

Projectinformatie / Project information

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Algemene informatie / General information

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petro-chemical derived polymers that possess a high-water solubility. o synthetic polymer that exhibits a homogeneous distribution of their functional groups over the polymer backbone. o polyethylene glycols, polyacrylic acid and polyquaterniums in these applications.

Korte omschrijving

- Preparation of modified and unmodified biopolymers (AVEBE and Glycanex).
- Screening enzymatic activity on the modified and unmodified biopolymers (WFBR).
- Chemical and structural analyses of the novel biopolymer structures (WFBR).
- Pilot studies to scale up the process conditions and to investigate scaling up affects (WFBR and AVEBE) and to provide enough material (200g) for further analytical screening and application testing.
- Determination of the solubility parameters in water and ethanol by use of the Hansen Similarity Parameters (WFBR and VLCl).
- Rheological characterization of the novel polysaccharide structures to determine the viscosity and physico-chemical characteristics (WFBR & AVEBE)).
- Biodegradability tests (WFBR, outsourcing)
- Application testing in various personal and home care applications, e.g., shampoo, hair conditioning, hair spray etc. (Ashland).
- To establish a structure-function relationship in order to determine fully or partly replacement of synthetic polymers (Ashland, VLCl, WFBR).
- A CAPEX/OPEX estimate to determine the techno-economic feasibility (WFBR, AVEBE, Glycanex and Ashland).
- Implementation perspective 2030.

Resultaat

- The mode of action of specific enzymes on modified and unmodified starches.
- How the degree of substitution affects the enzymatic activity.
- Optimum reaction conditions for enzymatic remodeling.
- Insight in how remodeling affects the structural characteristics of the biopolymer and the corresponding distribution of the functional groups.
- How re-structuring affects the solubility parameters and physico-chemical characteristics.
- A structure-function relationship to determine the level of substitution of the synthetic polymers in various

personal and home care applications. - Insight in the biodegradability in comparison to their native counter type and the synthetic polymers - A technical-economic feasibility study.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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