PolyAldaric

Publieke samenvatting / Public summary

Aanleiding

The BBC innovation theme “Sustainable bioresources” aims to develop innovative routes from biobased feedstocks to polyesters. In this context, uronic acid rich feedstocks present a huge opportunity as renewable resource for the production of aldaric acids. Aldaric acids are dicarboxylic acids that can be used as building blocks for polyesters such as poly(butylene terephthalate) (PBT) and poly(butylene adipate terephthalate) (PBAT) and could even be extended to polyamides (e.g. Nylon 66). Relevant uronic-acid rich feedstocks for the Netherlands are sugar beet pulp and processed seaweed. Sugar beet pulp is produced at 600 kton scale per year and seaweed processing will increase drastically in the coming years. Both feedstocks currently find outlets in low(er) value animal feed or biogas applications, while they could contribute to the materials transition. Though the chemocatalytic conversion of galacturonic acid to galactaric acid has been well established, a biocatalytic route could present key environmental and techno-economic advantages. In addition, the conversion of other uronic acids to aldaric acids with potentially different functionality is currently underexplored.

Doelstelling

The objective of the PolyAldaric project is to convert uronic acid rich renewable feedstocks into aldaric acids for utilization as building blocks in polyesters. PolyAldaric will pay specific attention to improving the conversion of crude feedstock streams by exploiting the aqueous solubility difference between uronic and aldaric acids. PolyAldaric will specifically

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Stichting Wageningen Research

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address the link between sugar beet and seaweed feedstock characteristics, mild hydrolysis into uronic acids and systematically compare chemocatalytic and biocatalytic routes to aldaric acids and associated required down-stream processing steps, all supported by techno-economic and implementation horizon considerations. This objective fits the quest for biobased building blocks for polyesters and is at the heart of the Sustainable bioresources innovation theme.

Korte omschrijving

To meet the project objectives, PolyAldaric sets out to perform the following activities: - Feedstock localization and characterization - Feedstock hydrolysis and processing - Biocatalytic conversion of uronic acids to aldaric acids - Chemocatalytic conversion of uronic acids to aldaric acids - Downstream processing of aldaric acid streams - Techno-economic, market and implementation assessment of both conversion routes.

Resultaat

PolyAldaric will deliver: 1. Validated technologies to produce uronic acid streams from renewable biobased feedstocks. 2. Optimized biocatalytic oxidation of various uronic acids to aldaric acids using enzymes. 3. Optimized chemocatalytic oxidation of various uronic acids to aldaric acids using heterogeneous chemocatalysts in aqueous conditions. 4. Validated upscaled production and purification of aldaric acids, aiming for kilogram-scale 5. A blue-print for renewable aldaric acid production based on techno-economic, market and implementation aspects of the developed value chain(s). 6. Effective, extensive communication and dissemination of research outcomes

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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