Liquids2Plastics

Publieke samenvatting / Public summary

Aanleiding

A recent scoping study on bioresources commissioned by Groeifonds BioBased Circular identified sugar rich side-streams from food industry as starting materials for the production of polyhydroxyalkanoates (PHA's) or chemical building blocks. However, many of these streams are very diluted with respect to carbon and other valuable components. The streams are costly to handle and compositionally inconsistent, often containing fats, solids, salts, and traces of cleaning agents. Their high microbial load makes them unstable and expensive to store or treat. In addition companies face significant wastewater and energy costs while regulations often classify these flows as waste, limiting reuse. Converting these streams into PHA offers a solution by using the entire organic load rather than extracting specific nutrients, turning a disposal problem into biopolymer production. PHA fermentation tolerates variable feedstocks, produces a stable biomass product, and leaves behind a mineral-rich liquid suitable for fertilization. Although some pre-treatment may be needed, PHA quality depends mainly on microbial processes, allowing consistent polymer production despite diverse feedstock origin.

Doelstelling

Liquid sugar rich side-streams often contain the required macro and micro nutrients for fermentation media, but at lower concentrations than preferred. These streams also contain a considerable amount of salts. We aim to develop a route for the valorisation of these liquid streams towards plastics, including the pre-treatment and fermentation step

Projectinformatie / Project information

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Algemene informatie / General information

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to biobased building blocks. The route is likely to contain a dewatering step in which we concentrate all components, and a conversion to PHA using more salt tolerant organisms. The residual water in these processes is less rich in nutrients. It may be recycled to agriculture, creating a circular system. Also, the specific recovery of nitrate will be investigated. A techno-economical assessment is at the core of the project, complemented by practical work on technology development. The project contributes to the EKOO Biobased Circular call by targeting the development of new biobased feedstock routes for polyester production, and contributing to circular-by-design objectives as it does not only convert organic carbon into a high-value, biodegradable polymer, but also produces a side stream that can be used for fertilization.

Korte omschrijving

Liquid side-streams can be interesting starting points for a fermentation, specifically to PHA or VFA, as is also supported by the GO!PHA platform. Within this project we study a diverse set of side streams from horticulture (SIGN), grass processing (Grassa), and food waste (AMS). The three industrial partners with liquid side-streams within the project will provide these materials and aid in pre-processing. These liquids will be characterised and if needed further adapted to fermentation conditions for PHA production by WFBR. The concentration of desired macro and micro nutrients will determine suitability as fermentation media, but other components might hinder fermentation. The residual water after fermentation may be recycled to agriculture, or used for nitrate recovery first. The latter will be investigated, using the technology provided by S&L Ventures. The project will lead to a process design that stimulates a circular system, and which will be validated in a techno-economical evaluation.

Resultaat

Liquids2Plastics aims to achieve the following key results at the end of the project: • A clear understanding of the composition, variability, and treatability of different liquid side streams • Validated pre treatment approaches that balance

cost and performance • Selection of robust microbial cultures that can convert these variable streams into PHA • Production of a mineral-rich effluent after fermentation with reduced odour, improved storage properties, and suitable for fertilization. • Validation of a process for nitrate recovery to obtain an additional product. • Techno economic assessment showing under which conditions PHA production from liquid side streams is cost competitive with disposal or alternative valorisation routes The final goal is a process design that valorizes problematic residual liquid side-streams from agri-food for use as a new biobased feedstock for biopolymer production.

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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