

Fermentation of renewable streams to mevalonic acid

Publieke samenvatting / Public summary

Aanleiding

The increasing demand for sustainable chemicals requires the production of platform chemicals from renewable resources. Especially, the use of 2nd generation sugars that do not compete with the food value chain as starting material is of importance. Fermentation appears to be a promising technology to convert 2nd generation sugars into value-added compounds, but the composition of the feedstock streams often causes negative effects on fermentation processes. This is due to the presence of different sugar mixes and/or toxic compounds and inhibitors in the streams. These effects can be circumvented by pre-treatment and detoxification steps and/or the choice of robust microorganisms for fermentation, able to utilise all sugars in the streams. Standard approaches usually are directed to modify a particular microbial host for growth on a certain feedstock, towards a product of interest, which results in extensively modified hosts which show low stability. By making use of the great metabolic diversity and adaptation properties of microbial strains, a different approach can be followed to find hosts that are naturally better suited for the use of specific feedstocks.

Doelstelling

The general goal of FERMEVA is to establish new value chains based on largely available 2nd generation renewable carbon feedstocks derived from waste cellulosic materials (wastewater treatment solid fraction, paper sludges), and side streams from forestry and the wood and sugar

Projectinformatie / Project information

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Algemene informatie / General information

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industries. As product of interest, mevalonic acid has been chosen, an important platform chemical, currently of fossil origin, with applications in pharma, food, renewable materials and polymers. The new value chains will be evaluated for their technoeconomic feasibility and sustainability using life cycle analysis. By establishing a new renewable carbon value chain, based on 2G feedstocks and wastes, to produce mevalonic acid and other bioproducts, FERMEVA aims to support the transition to a more sustainable Dutch chemical industry.

Korte omschrijving

To reach the goals, FERMEVA uses a multidisciplinary approach, with the following activities:

- Detailed chemical characterization of feedstocks and development of protocols for detoxification and substrate preparation for fermentation
- High throughput screening of fermentation performance of industrially relevant microbial hosts on the feedstocks.
- Production of mevalonic acid at laboratory scale on renewable feedstocks and determination of suitable downstream processing protocols for purification.

The mevalonic acid produced will be used for derivatization into products of interest such as 3-methyl-1,5-pentanediol (3MPD).

- The new value chains will be evaluated for sustainability (preliminary LCA), economic feasibility and CO₂- and other GHG reduction potentials by an expert partner on this area (PDC). Inputs on the processes from all partners will be integrated to identify eventual bottlenecks and generate feasible scenarios for implementation of the FERMEVA value chains
- Dissemination of the results obtained, after permission by all partners, in relevant scientific and commercial platforms. Search for possibilities of implementation of the value chains beyond FERMEVA

Resultaat

FERMEVA aims at the development of economic and sustainable value chains towards chemicals from renewable feedstocks, based on processes currently at commercial scale (Fibanol, sugar industry) and

pilot scale (Recell). These streams are side streams from existing processes, and their valorisation will contribute to generate extra value (economic, sustainability) to the industrial partners. The development of an economically feasible fermentation process (using industrial strains) from 2G feedstocks for mevalonic acid will contribute to a more sustainable chemical industry. The process will be ready for implementation at pilot scale within 2 years after the end of the project. In addition, knowledge obtained can also form the basis for the development of fermentation processes of other chemicals, such as organic acids, using 2nd generation feedstocks.

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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