Development of 2nd Generation Biorefineries Production of Dicarboxylic Acids and Bio-based Polymers Derived Thereof

Background

The existing 2nd generation biorefineries utilize less than 20% of the biomass feedstock for ethanol production. They also generate major side-streams such as pentose and lignin that are respectively used for biogas and energy production. Converting the carbon from these side streams into valuable products would increase the otherwise low profitability and improve the environmental benefits of the biorefineries.

BioREFINE-2G aims at developing commercially attractive processes for efficient conversion of pentose-rich side-streams from biorefineries into dicarboxylic acids, which can be used as precursors for bio-based polymers including biodegradable polymers.

The project covers the whole value chain:

- Characterization of side streams from forest and other non-food feedstock,
- Development of novel robust industrial yeast cell factories, fermentation and downstream process development,
- Polymerization methods development for the production of biodegradable polymers applicable as plastics, coatings or adhesives,
- Scale-up and demonstration,
- Life cycle and economic viability analyses.

Objectives

The goal of the BioREFINE-2G project is to develop and demonstrate a novel 2nd generation biorefinery concept using industrial yeast as production organism for the production of diacids and diacid derived biopolymers from side and waste streams rich in C5 sugar and mixtures of C5/C6 sugars.

Activities

The main project activities and objectives are:

- To utilize complex C5-C6 streams designing strains that withstand the environment in a 2nd generation biorefinery and efficiently utilize the C5-C6 carbon sources;
- To produce at least one, preferably two dicarboxylic acids in 2nd generation biorefineries;
- To develop downstream processing methods to purify diacids from the fermentation broth at purities required for polymerization;
- To develop methods for polymerization of the selected diacids to biodegradable as well other bio-based polymers such as polyesters and polyurethanes;
- To demonstrate and verify the fermentation process of diacid production in a several thousand liter-scale demo plant
- To evaluate the impact of the biopolymers produced through the BioREFINE-2G project through Life Cycle Analysis (LCA) and economics analysis.

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bioREFINE-2G

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