

BIONEER

Scaled-up production of next-generation carbohydrate-derived building blocks to enhance the competitiveness of a sustainable european chemicals industry



THE PROJECT

The focus of BIONEER is on the utilization of low-cost, sustainably sourced, lignocellulosic biomass as feedstock to produce novel platform chemicals for the difficult to decarbonize industrial sectors, such as liquid plastics used in personal care and coatings. The project moves beyond first-generation carbohydrate-derived chemicals, leveraging the (biotechnology, biochemistry, and chemistry) expertise of the consortium to scale-up the production of a novel range of monomeric and polymeric building blocks that allow for important additional functionalities to be conferred to biobased chemicals. In particular, BIONEER builds on the exceptional results of the EnXylaScope (Grant Agreement N° 101000831) and PERFECOAT (Grant Agreement N° 101022370) RIA projects, still ongoing at BIONEER project start. The consortium sees BIONEER as the timely next step to rapidly lift

key results from these projects to the next level of industrial demonstration in the frame of our overall commercially-focused exploitation strategy that will ultimately culminate in widespread deployment of the biobased innovations in the targeted mass-markets.

BIONEER Building Blocks (BBB) made from sustainably sourced biomass using bio and chemo-catalytic approaches will replace toxic and non-environmentally friendly fossil-based building blocks. The targeted fossil-based building blocks to be replaced are bisphenol A and its derivatives (for the UV-curable coatings market), as well as alkyl acrylates, vinyl pyrrolidone, vinyl acetate, and siloxanes (for the personal care market). Process residues will be considered for packaging applications.

OBJECTIVES

The main objective of BIONEER is to demonstrate and advance the potential of a number of different lignocellulosic biomass carbohydrate-derived components, to replace fossil-based functional building blocks and establish their route to market by showcasing their application potential in two different main sectors (furniture coatings, personal care). The main objective is divided into 4 technical objectives (TOs) and 2 non-technical objectives (NTOs):

- TO1: Sustainable feedstock with reduced import dependency and scaled-up processing of lignocellulosic biomass, for highly efficient and eco-friendly extraction of polymers and sugars as base compounds for microbial, biochemical, and chemical conversions.
 - TO2: Optimisation and scale-up production of microbial-derived base compounds from lignocellulosic sugar streams.
 - TO3: Optimisation and scale-up of novel production routes of building blocks from the base compounds via novel enzymatic and chemical catalysis routes following the SSbD framework.
 - TO4: Application testing and validation of the BIONEER building blocks (BBB) and process residues in three large industrial sectors: Personal care, Coatings, and Packaging.
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- NTO1: Ensure Safety, compliance with relevant regulations, and sustainability of the BIONEER production routes and products by using the SSbD framework as a guidance tool in process and product design.
 - NTO2: Provide a roadmap for entering the BIONEER platform chemicals into established fossil-based routes.

IMPACTS

BIONEER demonstrates at TRL7 two new technology platforms that can efficiently a) fractionate agricultural and forestry residues into biopolymers, as well as b) microbially convert fermentable sugar hydrolysates originated from lignocellulosic biomass residues into diverse base components and building blocks for their subsequent chemical upgrading into functional bulk ingredients. BIONEER will use abundant local residual biomass streams for producing building blocks for the coatings and personal care industry, which otherwise are heavily dependent on imported feedstock.

The BIONEER project will demonstrate a practical application of the circular bioeconomy concept in the chemical sector by developing new, sustainable and circular biobased base compounds and building blocks starting from the valorization of sustainable biobased feedstock sources. The production strategy that constitutes the core technology of the BIONEER process entails different advantages that provide direct benefits in terms of resource- and energy efficiency, cascading use of biomass, delivering impressive improvements along all the production chain

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