BioSPRINT

Improve biorefinery operations through process intensification and new end products

Summary

Lignocellulose is the single most widely available type of biomass in the world. It is an important sustainable source of raw materials for a range of bio-based applications, including bio-based chemicals and advanced biofuels. In Europe, there is a technical potential of 1,372 million tonnes of lignocellulosic biomass available, which – even with a doubling of the current usage – could support sustainable use, but only until 2030. Therefore, it is important that non-food biomass – including lignocellulosic biomass – are used efficiently to ensure ongoing supply into the future.

To improve usage to around 25 % – almost double the current level – will demand substantial improvements in usage and processing efficiency. However, current methods often produce relatively high concentrations of impurities and inhibitors, which can make conversion challenging and require numerous, resource-intensive downstream purification steps, thus reducing the overall biorefinery yield and/or leading to poor-quality products. It also increases production complexity and energy costs and greater demands on ensuring process safety.

The BioSPRINT project aims to valorise hemicelluloses, a mixture of polysaccharides that can be extracted, fractionated and converted for use in a range of applications. The project pursues a zero-waste approach, applying an integrated biorefinery concept that maximises conversion of lignocellulosic biomass feedstock and its by-products, sidestreams and residual streams into higher added-value products. The driving ambition is to valorise the previously-discarded or costly sidestreams and thus close the loop on maximising resource potential.

http://www.biosprint-project.eu/

Type of Action:
Research & Innovation Action

Feedstock origin: VC1 – lignocellulose

Start date: 01 June 2020

End date: 31 May 2024

BBI JU contribution:
€4,998,014.00

Objectives

The overarching objective of the BioSPRINT project is to improve the overall efficiency of lignocellulose processing by extracting and processing previously-discarded sidestreams, particularly hemicelluloses. Within this, it has a number of specific objectives. It will:

- Intensify purification of the extracted sugars by removing impurities present and/or generated in the lignocellulose fractionation steps during the upstream processes.
- Investigate intensified reaction methodologies for dehydrating sugars into furans (furfural and 5-HMF) and optimise

Expected impacts

By achieving its overall objectives, the BioSPRINT project will help to enhance the efficiency and therefore the longevity of existing lignocellulose resources. In addition to this, it will also contribute to specific BBI JU KPIs through:

- Creating at least four new cross-sector interconnections in the bio-based economy. One will be based on feedstock, one based on product and markets, one technology-focused and one business-focused. It will also encourage other interconnections through dissemination, communication and capacity-building.

their production as part of the catalytic conversion process.
- Develop methods to purify the converted sugar streams into non-aqueous functionalised furan monomer bulk/solutions and to minimise furans degradation during downstream processing.
- Convert furans into resol, novolac-type resins and polyols and formulate bio-renewable resins to allow convergence of different feedstock molecules into similar polymers during final polymerisation. This will maximise final product yields for consumers products.
- Simulate the improved biorefinery concept and processes, comparing them to the existing state-of-the-art. This will be followed by the integration and validation of the developed concepts and technologies.
- Demonstrate the sustainability and safety of the final processes and products throughout the product life cycle, thus establishing the economic feasibility of the BioSPRINT concepts and technologies.
- Establishing an entirely new bio-based value chain for recovering and transforming hemicellulose and sugars present in the wood treatment process of three biomass-derived streams. These will be used to develop valuable components for forming the raw materials for new bio-renewable resins and polymers.
- Elevating and validating the technology readiness level of four process intensification technologies - for upstream purification, catalytic conversion, downstream purification and polymerisation - and taking them to technology readiness level five.

In addition, the BioSPRINT project will bring a range of environmental benefits. It will seek to decrease biomass losses by at least 10 % and increase overall resource efficiency. In addition, it will reduce required energy consumption for separation and purification as well as reduce GHG emissions associated with downstream process steps within the biorefinery operations.

Consortium

- Dechema Gesellschaft fuer Chemische Technik Und Biotechnologie EV (Germany)
- AEP Polymers SRL (Italy)
- Dynamic & Security Computations SL (Spain)
- eBOS Technologies Ltd (Cyprus)
- Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung EV (Germany)
- IFEU - Institut fur Energie und Umweltforschung Heidelberg GmbH (Germany)
- IRIS Technology Solutions, SL (Spain)
- Kemijski Institut (Slovenia)
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Project coordination

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