

WoodZymes

Extremozymes for wood based building blocks: From pulp mill to board and insulation products



<https://www.woodzymes.eu/>

Summary

Many wood processing techniques require extreme conditions of heat and alkalinity. WoodZymes seeks to develop extremozymes (enzymes that can function under extreme environments) and extremozyme-based processes that will allow underutilised lignin and hemicellulose fractions of kraft pulp mills to be valorised. This will produce high-value bio-based compounds to be used as bio-equivalents of existing petroleum-based chemical building blocks and precursors.

In doing so, they will create substitutive components (lignin-based phenolic resins and polyols) for the manufacture of medium-density fibreboards (MDF) and polyurethane (PU) insulation foams, potentially reducing or avoiding the use of toxic ingredients, whereas the sugar-derived compounds will be used as fibre bonding enhancers in papermaking.

WoodZymes illustrates the potential of extremozymes in the global bio-based economy, contributing to the sustainability and competitiveness of cellulose and fibreboard and polyurethane manufacture.

Type of Action:

Research & Innovation Action

Value Chain: VC1 – lignocellulose

Start date: 01 June 2018

End date: 31 May 2021

BBI JU contribution: € 3,253,874

Objectives

The overarching of the WoodZymes project is to provide tailor-made extremozymes and extremozyme-based processes that are new to wood bio-refineries. These will produce biomass-derived chemicals that will provide alternatives to existing fossil-based chemical building blocks. Specifically, the WoodZymes project will seek to:

- Develop extremozymes that are adapted to harsh industrial operation conditions using screening and protein engineering. This will be followed by pilot-scale production for application in the wood conversion sector;
- Produce (assisted by extremozymes) and chemically characterise the lignin phenols and hemicellulosic sugars derived from underutilised side streams of hardwood and softwood kraft pulp mills;
- Develop new MDF and PU materials using enzymatic activation of lignin-based resin precursors and phenolic polyols;

Expected impacts

As well as its contribution to the overall BBI-JU goals and Key Performance Indicator, the WoodZymes project aims to make the following impacts:

- Create a new cross sectorial interconnection between the pulp and paper, enzyme technology, fibreboard, and PU products bio-economy sectors;
- Create a new bio-based value chain that valorises the side streams of the kraft pulp process;
- Increase the yield of lignin-derived phenols over existing depolymerisation processes using chemical catalysts and to extract hemicellulose sugars on a large scale from kraft pulp for the first time;
- Improve the competitiveness and sustainability of fibreboard and PU foam manufacture by reducing the use of petroleum-based components
- Improve the efficiency of the kraft pulp



- Use hemicellulose sugars and sugar-based amphiphilic polymers as papermaking additives.
- Evaluate the technical, environmental and socio-economic feasibility of the developed biotechnologies including market requirements, waste management, and LCA/LCC analyses

- process by valorising black liquor and by saving chlorine dioxide in pulp bleaching;
- Save energy during refining of paper thanks to the use of sugars extracted from pulp as fibre-bonding enhancers
- Reduce the use of resins in MDF thanks to new enzymatic technology
- Reduce the carbon footprint over the existing process

Achievements & milestones

Extremozymes for wood-based building bio-products

12 November 2018

Take a look at our project WoodZymes whose aim is to supply timber and paper industries with special enzymes to produce wood-based building blocks such as board and insulation bio-products. [Read more](#)

- Agencia Estatal Consejo Superior de Investigaciones Científicas (including CIB, Madrid; IRNAS, Seville; and IATA, Valencia) (Spain)
- MetGen OY (Finland)
- Centre Technique du Papier - CTP (France)
- Institut Technologique Forest Cellulose Bois-construction Ameublement - FCBA (France)
- Instituto de Investigação da Floresta e Papel - RAIZ (Portugal)
- The Navigator Company SA (Portugal)
- FINSA France SAS (France)
- Soprema (France)
- Fibre Excellence Saint-Gaudens SAS (France)

Project coordination

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