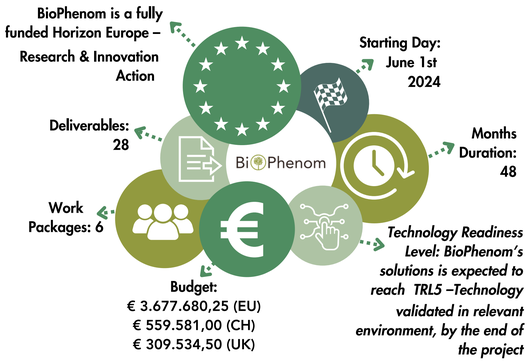
BioPhenom

MULTIFUNCTIONAL BIOPHENOLS FOR SAFE AND RECYCLABLE MATERIALS

Challenge

Common materials found in a wide range of end products and applications are often formulated with unsustainable petrochemicals, many of which are substances of very high concern (SVHC) due to their harmful effects on the environment and human health. Examples of materials containing SVHC include bisphenol-based thermoset epoxy resins, PAN-based carbon fibres, and wood or any other material treated with synthetic preservatives and flame retardants.

Therefore, there is an urgent need to replace materials containing unsustainable and hazardous petrochemicals by safe and sustainable bio-based materials that align with current EU strategies and policy frameworks such as the European Green Deal.



Solution

BioPhenom will produce biophenols from industrial biomass sidestreams using advanced technologies and processes such as fast pyrolysis and liquid extraction. The biophenols will be used to produce bio-based intumescent flame retardants (bio-IFRs) and replace SVHC in wood products, bio-CF thermoset composites, and PLA-based thermoplastic composites for specified applications.

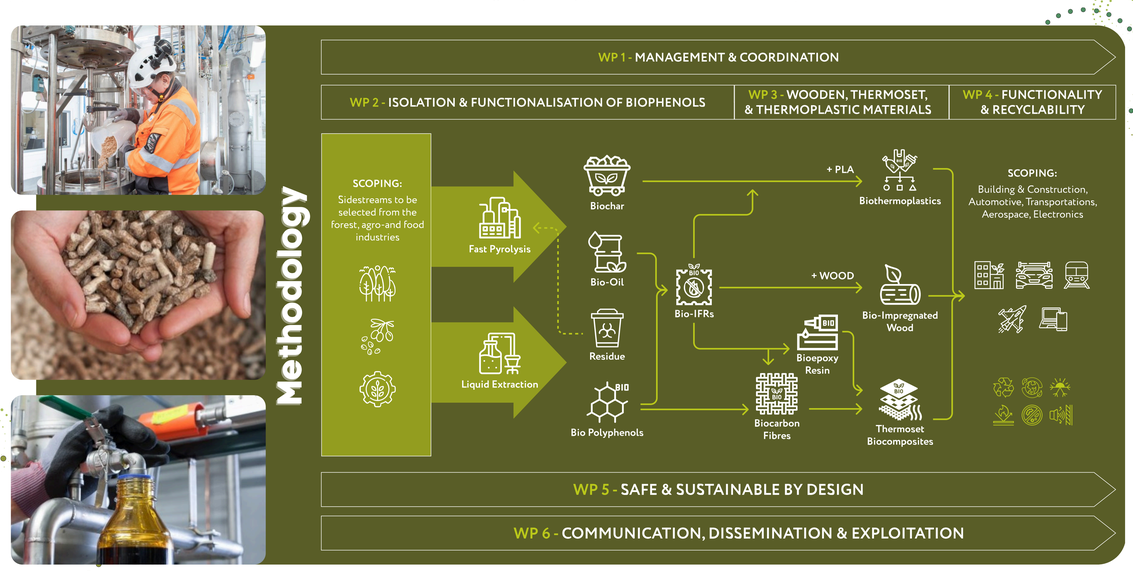
A scoping study will determine the selection of sidestreams and the most promising applications for the materials developed in the project. The process design, testing, and benchmarking against material functionality and application will follow the Safe and Sustainable by Design (SSbD) principles established by the EU Joint Research Centre.

Project

The BioPhenom project aims to address the significant challenge posed by the widespread use of unsustainable petrochemicals, many of which are substances of very high concern (SVHC) due to their harmful effects on the environment and human health. Some industrial practices use SVHC to formulate and improve the functionality of wooden, thermoset, and thermoplastic materials. These materials are toxic, non-recyclable, and accumulate in our ecosystems, thus prompting an urgent need for safer alternatives.

To deal with the safety and environmental issues related to the manufacture and disposal of chemicals and materials, the European Green Deal and its ambition for zero pollution, has introduced safe and sustainable by design bio-based solutions that can accelerate the transition towards a circular bioeconomy and reduce waste.

Leveraging advanced technologies and processes (i.e. fast pyrolysis, liquid extraction), the BioPhenom project seeks to exploit biophenols isolated from industrial biomass sidestreams to produce bio-based flame retardants and replace SVHC in the development of safe, sustainable, and recyclable materials (i.e. wood products, CF thermosets, thermoplastic composites) for different applications. The selection of sidestreams and the most promising applications for the materials developed in the project will be determined by a scoping study, and the process of design, testing, and benchmarking against material functionality and application will follow the Safe and Sustainable by Design (SSbD) principles established by the EU Joint Research Centre.



Specific Objectives

The overall objective of BioPhenom will be attained by a set of 6 complementary-specific objectives:

1. Scope opportunities and challenges for the development of safe and sustainable bio-based solutions from biophenol-rich biomass sidestreams.

2. Select and design the isolation and functionalisation of biophenols from selected sidestreams.

3. Test and develop safe and sustainable by design wooden, thermoset, and thermoplastic materials.

4. Assess and benchmark the functionality and recyclability of product demonstrators.

5. Integrate and develop the SSbD framework for assessing the safety and sustainability of biomaterials.

6. Contribute high-quality data generated along targeted value chains through effective and efficient dissemination, communication, and exploitation activities.

Expected Outcomes

The BioPhenom Project is poised to have a significant impact across various dimensions:

1 Reduce Dependency on Harmful Substances

BioPhenom's ambition is to replace fossil-based feedstocks with bio-based alternatives and reduce the use of harmful substances in materials and formulations. This approach aims to develop final bio-based products that are safer, exhibiting low human and ecotoxicity, while still meeting overall environmental sustainability requirements.

2 Enable Circularity by Design

BioPhenom products are designed for circularity, especially in areas where recyclability is currently challenging due to safety concerns. This ensures that products can be reused and recycled, enhancing resource efficiency and reducing pollution.

3 Build a Portfolio of Bio-based Solutions

BioPhenom focuses on developing a portfolio of promising bio-based solutions that have the potential for scale-up production and future market uptake. These solutions will be safe, circular, and sustainable, promoting environmental sustainability and economic growth.

Consortium

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- LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY (LIST)
- NIBIO - NORSK INSTITUTT FOR BIOOKONOMI (NIBIO)
- FUNDACION CIDETEC (CID)
- CONSIGLIO NAZIONALE DELLE RICERCHE (CNR)
- SPECIFIC POLYMERS (SP)
- RTD TALOS LIMITED (TALOS)
- INVENT INNOVATIVE VERBUNDWERKSTOFFE REALISATION UND VERMARKTUNG NEUER TECHNOLOGIEN GMBH (INVENT)
- TREET (TREET)
- SILVACHIMICA (SILVATEAM)
- EDELWEISS CONNECT GMBH (EwC)
- THE UNIVERSITY OF BIRMINGHAM (UoB)

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