R&D Projects

LNEG
Laboratório Nacional de Energia e Geologia

Bioenergy and Biorefineries Unit

Optimized oxidative enzyme systems for efficient conversion of lignocellulose to valuable products

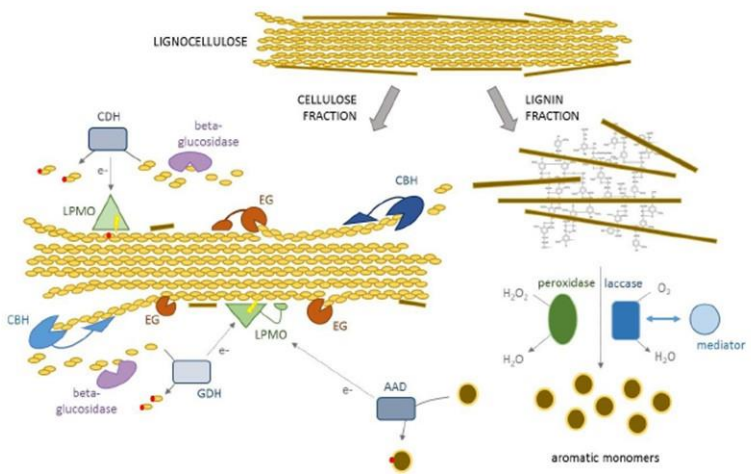
OXYMOD

Motivation

Need for new, efficient technology to optimally utilize sustainable raw materials for the production of transportation biofuels and bio-based chemicals, thus contributing to building the circular bioeconomy and mitigating climate change

Objectives

The **OXYMOD** project will through a transdisciplinary approach define, develop and demonstrate applicability of **new enzyme systems for the efficient biocatalytic conversion of lignocellulose** from abundant Norwegian biomass into **valuable products** like **sugars** and **aromatic building blocks**. OXYMOD will focus on the still largely underexplored group of **redox enzymes** and their potential in the **depolymerisation of cellulose**, **hemicellulose** and **lignin**, including aspects such as redox enzyme interplay, co-factors and reaction partners, as well as their interplay with hydrolytic enzymes. OXYMOD will address these enzymes and enzyme systems as they occur and function in, among others, a unique in-house collection of approx. 1000 marine Actinobacteria isolates with genomes recently sequenced.
Redox enzymes require co-factors and redox partners, and there is a considerable degree of cooperativity between different enzyme classes. **Enzyme systems-scale** understanding and eventually engineering the efficient degradation of lignocellulose by these enzyme systems, requires an **integrated transdisciplinary approach** far beyond 'simple' enzyme discovery.



Research Area

Biorefineries/ Biofuels/ Biomass for Industry

Key-words

Biorefineries, biofuels, Bio-based chemicals, lignin lignocellulolytic enzymes

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Partnership

Norwegian Partners:

NMBU - Norwegian University of Life Sciences (coordinator)

SINTEF

NTNU - Norwegian University of Science and Technology

Vectron Biosolutions AS.

Portuguese Partners:

LNEG

FCT/UNL

Project Duration

2017-2022

OXYMOD combines life sciences (enzyme biochemistry, enzyme production technology, microbial biotechnology, high throughput screening, advanced analytics), ICT (bioinformatics, big data handling), mathematical sciences (enzyme systems modelling, process modelling) and engineering (enzyme evolution, synthetic biology) for producing new and optimized biocatalytic systems for industrial application, primarily within the agricultural and forest sectors.

Besides the enzymes and enzyme systems themselves, additional innovations from OXYMOD concern the generation of well-defined products streams, primarily **sugars** from **(hemi-)cellulose** and **aromatic building blocks** from **lignin** for a variety of downstream applications (e.g. biofuels & bioplastics).