

## **INDOX: Optimized oxidoreductases for medium and large scale industrial biotransformations**

### **Description**

The INDOX proposal on industrial oxidoreductases aimed to provide relevant industrial case stories to demonstrate the efficacy of optimized biocatalysts on targeted reactions, and to establish the processes scalability, sustainability and cost-efficiency versus chemical conversion processes. The chemical industry (specialties excluded) is not yet embracing enzymatic oxidation reactions to a significant extent primarily due to lack of biocatalysts with the required selectivity, availability and compatibility with the rigorous process conditions.

Selected industrial oxidation and oxyfunctionalization target reactions form the basis for the INDOX screening and optimization of new biocatalysts, including: i) Intermediates for agrochemicals/APIs; ii) Polymerprecursors and functionalized polymers; and iii) Intermediates for dye-stuffs. The project flow comprises: i) Recovery of selective biocatalysts from the groups of heme-peroxidases/peroxygenases, flavo-oxidases and copper-oxidoreductases from fungal genomes and other sources; ii) Improvement of their oxidative activity and stability by protein engineering (using rational design, directed evolution and hybrid approaches combined with computational calculations) to fulfill the operational and catalytic conditions required by the chemical industry;and iii) Optimization of reaction conditions and reactor configurations (including immobilization technologies and new enzymatic cascade reactions). Finally the cost efficiency compared to chemical processing was evaluated.

The INDOX approach was supported by a highly-specialized consortium of SMEs, large companies and research/academic institutions. Production of the new optimized biocatalysts and their introduction into the chemical market will take advantage from the participation of the world-leading company in the sector of industrial enzymes, together with several chemical companies willing to implement the new medium- andlarge-scale biotransformation processes.

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