Redox biocatalysis in non-conventional media

Master Thesis at the Biocatalysis and Bioprocessing Group

Introduction
Biocatalysts are amongst the catalysts of choice for synthetic chemistry, if a high selectivity (regio-, chemo-, and stereo-) is desired. However, besides excellent selectivity, high product concentrations are also necessary for technical and economic feasibility. Owing to the limited solubility of hydrophobic reagents and water-induced side reactions, high volumetric productivities could not typically be achieved in aqueous media. The application of enzymes in non-aqueous environment is of great interest in the biocatalysis community.

Figure 1. EC 1-catalyzed reaction in organic media.

The use of hydrolases (EC 3) in non-aqueous media is an established approach and already proven at industrial scale. Whereas, oxidoreductases (EC 1) – which catalyze synthetically interesting reduction and oxidation reactions – have been limitedly applied in low-water conditions (Fig. 1).

This project will deal with the analysis of the effects of some conventional organic solvents (e.g., EtOAc, MTBE, toluene, heptane, etc.) on the activity, stability, selectivity, and kinetics of chosen redox enzymes under water-deficient conditions.

Requirements
Academic: General knowledge of chemical/biochemical catalysis and thermodynamics, as well as of chemical engineering and organic chemistry
Personal: Commitment, teamwork qualities, ability to work independently

Fields of Research
- Industrial biotechnology
- Biocatalytic cascades
- Redox biocatalysis
- Cofactor regeneration

Experimental assignments
- Recombinant enzyme production
- Enzyme activity, stability and kinetic assay by photometer
- Selectivity determination of the enzymatic reaction by GC
- Biotransformation in non-aqueous media

Beginning: January 2019 (or the earliest possible day thereafter)

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