

Master Research Projects 2016

NOVA ITQB, Oeiras

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Project 2 – Enzymatic biotransformation of model lignin compounds

Areas: Organic Chemistry/Biochemistry/Enzymology/Biotechnology

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Biocatalysis is considered a key component for the development of a sustainable bio-economy. Enzymes are sustainable, selective and efficient, and offer a variety of benefits such as cleaner reactions with lower energy requirements. The use of lignin-degrading enzymes alone or in combination with other physical or chemical methodologies has the potential to make lignocellulosics pre-treatments commercially viable. Additionally, waste lignocellulosic (i.e. from forestry or agricultural activities) or processing by-products (e.g. sawdust) are particularly interesting to fuel the non-food applications such as chemicals production. Intensive research has focused in recent years on the conversion of lignin to high value chemicals and fuel precursors, using physicochemical approaches including thermochemical and catalytic routes. However, currently, these strategies are not cost-effective and new (bio)catalytic, solvent free and environmentally friendly green processes need to be optimized and implemented.

The goal of this proposal is to investigate the cooperative and complementary action of enzymatic systems in the transformation of a set of phenolic and non-phenolic lignin model compounds. These compounds will be first synthesized and characterized and afterwards their biotransformation will be tested with well-characterized lignolytic enzymes, CoTA laccase and Dyp-peroxidases. The identification of intermediates and products of reactions will be derived from analytical and spectroscopic techniques (NMR and MS), allowing for the elucidation of enzymatic mechanisms and to explore the possibility of producing building blocks or low molecular weight added-value compounds. These studies will contribute to design new green catalytic processes.