

PhD fellowship (CIFRE)

‘Novel Fungal Oxidative enzymes for the Valorization of Alcohols and Plant Biomass’

Key words:

Fungal biodiversity, Copper-Radical Oxidases, Biocatalysis, Biomass, Aldehydes, Biomaterials

Context:

The present PhD fellowship position is part of a recently funded international ANR project in collaboration with Canada at the interface of biology and chemistry. The general context is based on the development of high-performance biomaterials and goods from forest and agricultural biomass via environmentally responsible processes, which are central to a sustainable bio-based economy. In nature, filamentous fungi play a crucial role in the degradation/modification of carbohydrates and secondary metabolites through the production of oxidative enzymes. Despite their biological importance and application potential, catalytic diversity of oxidase-like enzymes has not been widely explored. State-of-the-art, genomic, biochemical, structural and biophysical methods will be used to reveal untapped catalytic potential among the diverse family of **oxidative enzymes** that modify polysaccharides and/or alcohols through the surgical introduction of carbonyl functional groups. The research project is dedicated to the discovery, the characterization and applications of novel fungal oxidative enzymes. Beside the fact that this family has still not been deeply explored, it presents strong interest in terms of activity. These biocatalytic activities provide a unique opportunity for upgrading forest and agricultural biomass (fibres, hemicelluloses, and extractives) to bioproducts of increased value. Through multi-disciplinary expertise of highly qualified personnel, international research exchange, and interaction with dynamic French (Mane) and Canadian (Novozymes) companies, this project will generate high-fundamental input and environmentally sustainable biotechnology applications.

Description of the position:

The PhD fellow will work between ISM2-Biosciences and INRA-BBF in relationship with the industrial partner Mane. The PhD student will be involved into (i) the selection of a set of genes encoding new fungal oxidative enzymes from the CIRM-CF fungal collection, (ii) the production and biochemical characterization of the corresponding enzymes, (iv) the optimization of experimental conditions to allow their integration into biotechnological processes.

The PhD fellow will be co-supervised by Drs. Michael Lafond and Jean-Guy Berrin for the enzymes production and characterization (at ISM2 and BBF respectively), and by Dr. Fanny Lambert for the bioconversion process into the biotechnology lab of Mane. The applicant will spend a few weeks at UBC-MSL (Vancouver, Canada) to assist the carbohydrate functionalization procedure under the supervision of Pr. Harry Brumer.

Candidate profile:

The applicant must have a solid background in protein **biochemistry** and associated techniques (cloning, heterologous expression, purification, enzyme kinetics and biochemical characterization). Notion in biophysics (e.g. EPR, NMR) will be appreciated. S/he is required to work independently and interactively and to possess good oral and written communication skills (French and English).

Host institutions:

Institut des Sciences Moléculaires de Marseille, Equipe Biosciences, UMR 7313 CNRS-Aix-Marseille Université: Dr. Lafond, French project coordinator and thesis co-director.

Laboratoire de Biodiversité et Biotechnologie Fongique, UMR 1163 INRA-Aix-Marseille Université (French academic partner): Dr. Berrin, French scientific investigator and thesis co-director.

MANE Company, Bar-Sur-Loup (French industrial partner): Dr. Lambert, French industrial investigator and thesis advisor.

Michael Smith Laboratories - University of British Columbia (Canadian academic partner): Pr. Brumer, collaborator.