



## Internship Master 2

### Enzymatic Functionalization of Lignin for Material Applications

**Keywords:** Lignin, functionalization, enzymes, unconventional solvents, biochemistry.

**Context and objectives:** Lignin, the second most abundant natural biopolymer after cellulose, represents the largest source of aromatic compounds and holds significant potential for developing materials with antioxidant, antibacterial, and UV-blocking properties. Nevertheless, its application is constrained by its heterogeneity and complex structure, which adversely affect its physicochemical properties and reactivity, thus limiting its applications in materials. Functionalization of lignin through esterification could enhance its solubility and compatibility with hydrophobic matrices. Among the modification approaches, enzymatic functionalization emerges as a more environmentally friendly alternative, offering greater selectivity for the transformation of this biopolymer.

This project aims to functionalize lignin using enzymes to develop material applications. The candidate will be tasked for selecting unconventional solvents to solubilize lignin and enzymes for the esterification reactions. A solvent screening method will need to be developed, accompanied by a stability study of the enzymes in these solvents. Subsequently, an initial series of enzymatic reactions with model compounds will be conducted under fixed reaction conditions to assess the effectiveness of the functionalization. Finally, a preliminary evaluation of reactions using lignin as a substrate is anticipated. Upon completion of the internship, the intern should acquire practical skills in enzymology as well as in the characterization of biomolecules and biopolymers.

**Workplace :** *UMR CNRS 5518-Laboratoire de Génie des Procédés pour la Bioraffinerie, les Matériaux Biosourcés et l'Impression Fonctionnelle (LGP2).* Address: 461 Rue de la Papeterie, domaine universitaire -CS 10065, 38402 Saint Martin d'Hères Cedex-France. The intern will be supervised by experienced researchers from the BioChip team, providing a rich and multidisciplinary learning environment.

**Methodologies and techniques:** Chemical characterization, HPAEC, HPLC, SEC, GPC, GC-MS, SEM, UV-Visible spectrophotometry, FTIR spectroscopy.

**Student profile:** Master's 2 student in biochemistry or biotechnology with a strong interest in interdisciplinary research. Knowledge in plant biomass chemistry and analytical chemistry is particularly expected. Laboratory skills, autonomy, proactivity, analytical abilities, and strong communication skills are essentials. Fluency in both French and English is also highly valued.

**Required documents:** CV, cover letter, Master 1 transcript, and letter of recommendation by **November 28, 2024**. To be sent to : [maria.quesada-salas@grenoble-inp.fr](mailto:maria.quesada-salas@grenoble-inp.fr) and [gerard.mortha@grenoble-inp.fr](mailto:gerard.mortha@grenoble-inp.fr)

**Position start date: February or March 2025 (to be confirmed soon)**