DryBioMat Project: Impact of dry processes on the chemical composition and structure of bio-based materials

Keywords: lignocellulosic biomass, extractives, analytical chemistry, dry processes

Project context

For several years now, numerous bio-based solutions have been emerging to substitute certain petroleum-based products in order to limit soil, water and air pollution. However, these solutions often consume large amounts of water and energy, or use petroleum-based adhesives. The DryBioMat project therefore aims to evaluate the potential of dry processes for manufacturing bio-based materials that are high-performance, energy-efficient and cost-effective, without using water or adhesives. The dry processes used are ultrasonic compression moulding and thermocompression, applied to lignocellulosic materials derived from wood industry waste.

The initial results of this project have highlighted marked visual differences and variations in mechanical properties depending on the different process parameters applied. However, the impact of these parameters on the chemical composition and structure of the main biopolymers in biomass (such as cellulose, hemicellulose and lignin) has not yet been explored. These processes can induce various reactions in biomass components, such as degradation, hydrolysis, condensation, recondensation, oxidation and reduction of biopolymers, the nature and intensity of which depend on the operating conditions and the composition of the biomass.

The project is funded by the ANR (French National Research Agency) and is a collaboration between two laboratories: LGP2 (Laboratory of Process Engineering for Biorefinery, Bio-based Materials and Functional Printing) and 3SR (Soils, Solids, Structures, Risks Laboratory) located on the Grenoble campus. The internship will take place at LGP2, within the Matbio research team, which focuses on multi-scale bio-based materials. Two doctoral students in their final years are currently working on the project.

Subject description

The aim of this internship is to study the changes induced by dry processes on the structure and chemical composition of the materials produced. A literature review will be conducted to determine the most appropriate and relevant analytical methods to use. These methods will then be implemented to quantify the various components of biomass and study their structural properties. The aim will be to assess the changes in the chemical composition and structure of biomass when subjected to dry processes.

Application

The candidate must have an engineering degree or master's level in materials chemistry, skills in biomass chemistry and analytical chemistry are expected. Knowledge of chromatographic techniques (HPAEC, HPLC), UV-Visible spectrophotometry, and FTIR spectroscopy would be a plus. A good level of English is required, as the laboratory is an international environment. Autonomy, motivation, initiative and the ability to work in a team are skills expected for recruitment.

The internship will last 5 to 6 months, with a planned start date in February/March.

To apply, please send your resume (CV) and cover letter before Friday, November 28, to:

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