

Fiber Extraction from Secondary Biomass: Valorization of Paper and Cardboard Recycling Waste.

Context

Paper and cardboard recycling has made great progress in recent decades. However, conventional processes cannot recycle more than 90% of the material. The remaining 10% of waste, in liquid or solid form, is not valorized by the papermaker. This represents both a cost and an environmental challenge. Moreover, the growing demand for recycled cellulosic fibers has led to a significant increase in waste generation.

The “PACkaging, Recycling, Recyclability, Re-use of papers and cardboards” (PAC3R) project aims to reduce the amount of waste associated with the recycling of paper and cardboard packaging, to valorize the waste, and to improve the properties of the recycled cellulosic fibers. This project is part of a national program, known as PEPR (Priority Programs and Equipment for Research), funded by the French National Research Agency (ANR).

This internship will focus on the valorization of waste, with a particular emphasis on the fiber fraction. The project aims to extract and process fibers from paper recycling waste to produce high-value cellulosic products.

Missions

The work will focus on analyzing the composition of cardboard recycling waste (TGA, DSC, FTIR, SEM-EDX, ash content, starch content, cellulose content, optical microscopy). Different green strategies to extract and purify the fibers will be considered: oxidation (ozonation), hydrolysis (acid hydrolysis, enzymatic hydrolysis), mechanical treatment (ball-milling, grinding), flocculation, and physical sorting (hydrocyclonic cleaning, screening). Further treatments will be investigated to transform the recovered fibers into high-value cellulosic derivatives: mechanical, enzymatical and chemical fibrillation, oxidation, functionalization, cross-linking. Chemical characterizations will be conducted to evaluate the extraction efficiency, while optical and physical characterizations will be performed to assess the properties of resulting cellulosic products.

Profile

Student in Master 2 or equivalent in Chemistry, Materials or Process Engineering, seeking for a research-oriented addressing industrial challenges. Pre-requisites in chemical engineering, analytical chemistry and lignocellulosic biomass are expected. The selected candidate will be able to demonstrate scientific curiosity, rigor, autonomy and enthusiasm, as well as team spirit and interpersonal skills. The gratification will be equal to that required by the legislation.

The internship will start in **February 2026 for a duration of 6 months**. The internship will be located at LGP2 (Grenoble, France), and supervised by Lorette Brault, Post-Doc, and Nathalie MARLIN, associate Professor.

Contact

Please send your CV and a cover letter **before November 7th, 2025** to Lorette BRAULT, lorette.brault@grenoble-inp.fr.