

Internship Proposal – Level M2

Experimental Study on Impact of Recycling of Resins on the Tensile and Physical Properties of Flax Fibres

Context and Description:

Bio-based composites reinforced with plant fibres such as flax are a promising sustainable alternative to conventional glass or carbon fibre composites. Their low environmental footprint and competitive specific mechanical properties have made them attractive for lightweight structural applications. However, most of these composites still use thermoset matrices that cannot be reprocessed, which makes end-of-life management a major obstacle to a truly circular materials economy.

Recyclable thermosets, containing covalent adaptive networks (CANs) allow the matrix to be chemically depolymerised, so the reinforcing fibres can in principle be recovered and reused. Yet the effect of these chemical recycling processes on the plant fibres themselves is still poorly understood¹.

The aim of this internship is therefore to assess experimentally how chemical recycling of the matrix affects the tensile and physical properties of flax fibres. Flax fibre composites made with CAN matrix will undergo chemical recycling, and the recovered fibres will be compared with virgin fibres. Together, these results should clarify how the recycling route and matrix chemistry determine the quality of the recovered fibres, and so help define the conditions under which recycled flax fibres can be reused in high-performance bio-based composites.

Internship Objectives:

The student will actively contribute to the various stages of the project. Their main tasks will be to:

- Fabrication and chemical recycling of composite materials (Figure 1)² ;
- Prepare and perform single fibre tensile tests for virgin and recycled fibres;
- Perform FTIR, density and optical measurements to supplement tensile test observations;
- Analyse experimental results to identify the underlying mechanisms and link observations across different scales.

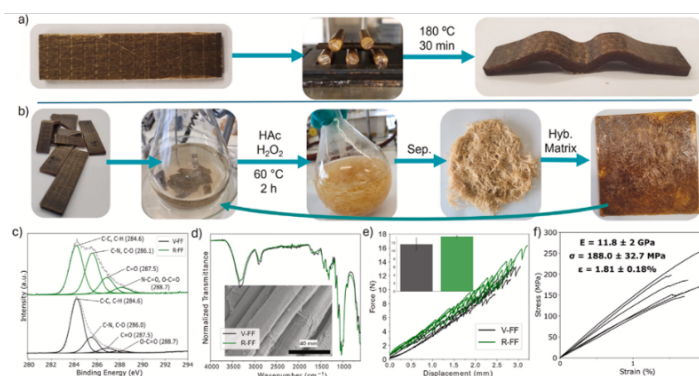


Figure 1 : Manufacturing, recycling and mechanical testing of EP-PUH flax composites.

Desired Profile:

You are a Master's student (university or engineering school) specialising in mechanics, materials science, or a related field. Knowledge or interest in composite materials, natural fibres, or polymers would be an advantage. You have a strong interest in experimental work and a rigorous approach to testing and data analysis. You can work independently while collaborating effectively with the research team.

Host Laboratory: FEMTO-ST Institute

Department of Applied Mechanics (DMA)

Team MAT'ECO (Materials for Ecological Transition)

Duration: 5–6 months starting in February 2027

Compensation: Approximately €550/month

This internship is funded by the Bourgogne-Franche-Comté Region.

Supervision: Florian BOUTENEL, Associate Professor, SUPMICROTECH

Vincent PLACET, Research Engineer, Université Marie et Louis Pasteur

Prajwal JAYARAMAN, PhD Candidate, Université Marie et Louis Pasteur

Please submit a **CV**, a **cover letter**, and your **transcripts including class ranking** (M1 level) to
florian.boutenel@femto-st.fr

¹ Buffet, Coralie, et al. *Composites Part A: Applied Science and Manufacturing* (2026): 109595.

² Seychal, Guillem, et al. *Chemical Engineering Journal* 511 (2025): 161506.