

## Chemical and Enzymatic Pretreatment of Cellulosic Fibers for Nanocellulose Production by Hydrodynamic Cavitation

5 to 6 Month Internship – Start in February 2027

### Context

Cellulose nanofibrils (CNF) are a promising bio-based material (conductive inks, barrier coatings), but conventional production routes (homogenization, microfluidization) remain highly energy-intensive. The CAVITOSE PhD project, conducted at LGP2 with LEGI (Grenoble INP, Université Grenoble Alpes, CNRS), explores an alternative: on-chip hydrodynamic cavitation in silicon-Pyrex microchannels, targeting CNF production below 1 MJ/kg, roughly two orders of magnitude lower than established mechanical routes. Untreated fibers tend to fragment rather than fibrillate under cavitation: they must first be charged or weakened through chemical (e.g. TEMPO-mediated oxidation) or enzymatic pretreatment.

### Objectives

The internship focuses on fiber pretreatment, upstream of the cavitation chip, at the interface between fiber chemistry and process engineering. Main tasks:

- Selecting cellulose sources (cotton, bleached and unbleached hardwood kraft pulp; dried vs. never-dried fibers)
- Applying and comparing chemical (TEMPO-mediated oxidation, carboxylation) and enzymatic pretreatments
- Characterizing pretreated fibers (charge density, degree of modification, morphology, suspension rheology)
- Linking pretreatment conditions to fibrillation outcomes on the cavitation bench, with the PhD student

### Candidate Profile and Key Information

Final-year engineering or Master's student in chemistry, materials science or process engineering, with a background in cellulose chemistry (or a strong willingness to acquire it). Lab experience in biopolymer modification is a plus. Good English, autonomy and rigor are required.

- **Location:** LGP2 (Laboratory of process engineering for biorefinery, bio-based materials and functional printing), MatBio team, Grenoble campus. <https://lgp2.grenoble-inp.fr/>
- **Supervision:** Loïc Voisin (PhD student, CAVITOSE project), under the direction of Julien Bras
- **Duration:** 5 to 6 months, starting February 2027
- **Compensation:** According to current rates

To apply, please send your CV and any supporting material to [loic.voisin1@grenoble-inp.fr](mailto:loic.voisin1@grenoble-inp.fr)  
Application deadline: 15/11/2026 (applications reviewed on a rolling basis)