

# ITI HiFunMat Master Internship Proposal

M 1

M 2

**Title** Tuning the thermomechanical properties of novel sustainable polymeric materials

## Internship supervisor

Name, first name	Vahdati, Mehdi and Cedano, Francisco
E-mail, Telephone	mehdi.vahdati@ics-cnrs.unistra.fr francisco.cedano@saint-gobain.com
Laboratory	CNRS, Institut Charles Sadron in collaboration with Saint-Gobain Recherche Aubervilliers
Collaboration with a HiFunMat member ( <i>please indicate their name</i> )	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes :

## Student profile looked for

Master program ( <i>more than one box can be ticked</i> )	<input checked="" type="checkbox"/> Material science and engineering <input type="checkbox"/> Chemistry <input checked="" type="checkbox"/> Physics
Other indications if necessary	Candidates with a profile in polymer physical chemistry, polymer physics, and materials science are encouraged to apply. Experience in polymer physics and/or thermomechanical characterization techniques will be a plus.

## Internship description

### Context

Organic-based binders widely used in the construction chemicals sector allowed to build low-cost, long lasting and high-performance structures. To reach carbon neutrality by 2050, this industrial sector requires new products that can be recycled, reuse or deconstructed easily, while being low cost, water based, versatile in different environments, and performing as conventional products. Lately, Saint-Gobain has developed new bio-inspired materials based on complex coacervation to meet these industrial challenges. These coacervates have many potential applications in various fields, including coatings, binders, and adhesives.

In collaboration with Institut Charles Sadron (ICS), Saint-Gobain Research Paris (SGR P) has developed coacervate-based formulations that cure when sprayed with water reducing work time for the users. However, controlling the mechanical properties, and in particular the flexibility, of the final materials (i.e. once dry) is a challenge.

The main objective of this internship is to formulate at ICS novel coacervates in close collaboration with SGR P and to study different parameters on the composition and the mechanical properties of coacervates before and after application. In particular, the goal is to explore various polymers of different molecular weights to develop a library of coacervates with wide-ranging mechanical properties.

### Objectives

1. Formulate coacervates using different polymers by adjusting salt concentration and or pH
2. Determine the composition the coacervates using thermogravimetric analysis (TGA)
3. Mechanical characterization of the coacervates via linear rheology
4. Determine the thermomechanical properties of dry coacervates
5. Transfer of formulations and technical meetings between ICS and SGR P