

# ITI HiFunMat Master Internship Proposal

M 1

M 2

**Title : Green electrospinning of bio-based nanofiber mats for air filtration application**

## Internship supervisor

Name, first name	Lobry, Emeline
E-mail, Telephone	elobry @unistra.fr
Laboratory	ICPEES
Collaboration with a HiFunMat member ( <i>please indicate their name</i> )	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes : Anne Hébraud, Guy Schlatter

## 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 type="checkbox"/> Physics
Other indications if necessary	additional characterizations will be performed in collaboration with IMTAtl Nantes – Dr Félicie Théron

## Internship description

The main task of this M2 internship, for student registered to the Graduate School, is to develop new nanofibrous layers based on bio renewable resources and green electrospinning. Cellulose derivatives will be selected during this internship. Different fibers morphologies are considered depending on the formulation. In a first way, green solvents will be tested to produce the nanofibers. In a second way, emulsion electrospinning will be considered by combining the use of poly(lactic acid) PLA and cellulose nanocrystals CNC. Water in oil emulsion consisting in aqueous suspension of CNC in a continuous PLA solution will be electrospun. The droplets size will vary to tune the fiber morphology. Indeed, it is expected that depending on the droplet size, the droplets will either coalesce, deform, or keep their size. The solvent evaporation between core or shell will be also crucial to control the final fiber morphology. The different morphologies of nanofibers will be characterized by SEM or TEM.

The main application for these membranes is air filtration. The porosity and pore size distribution will be evaluated by capillary flow porometer. The most promising mats will be sent to IMTAtl to evaluate their filtration performance (efficiency and pressure drop).

### Missions

- Bibliographic study on cellulose electrospinning and green strategies
- Formulation of different mix for electrospinning (solution, emulsion...)
- Electrospinning
- Characterization of the morphology of the nanofibers (SEM)
- Characterization of porosity and filtration performance
- Link between process, nanofiber morphology and filtration performance