ITI HiFunMat Master Internship Proposal

☒ M 1 ☒ M 2

Title

Internship supervisor

Name, first name	Biniek, Laure
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Laboratory	Institut Charles Sadron
Collaboration with a HiFunMat member (*please indicate their name*)	☐ No ☒ Yes : Laurent Simon, Gérald Chaplais, Nicolas Leclerc

Student profile looked for

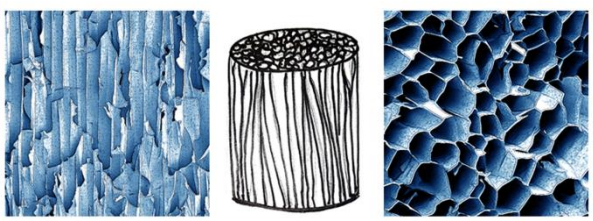
Master program (*more than one box can be ticked)*	☒ Material science and engineering ☒ Chemistry ☐ Physics
Other indications if necessary	

Internship description

Porous conducting polymer materials are of growing interest for various applications such as sensors, energy storage or power generation. These conducting polymer materials can be prepared by gelation of the polymer in a solvent followed by solvent extraction (freeze drying or supercritical drying method). The porous structure (pore size/geometry/directionality,...) plays an important role in the properties of the polymer. In particular, the thermal conductivity of the materials can be strongly influenced. Recently, we have developed honeycomb-like structures and 3D fibrillar networks. [1, 2] Open cells and double porous structures are our next challenge!

This internship aims firstly to develop new processing methods to control the porous structure of the polymer. Second, composite porous materials (polymer blends; or blends of polymer & conducting covalent organic frameworks or particles) will be considered to enhance the charge transport properties. A literature review on this topic will be carried out first. Experiments will be carried out to determine the important parameters that can influence the porous structure (solvent mixture, effect of pressure and temperature...).

All polymeric materials will be characterized by electron microscopy (SEM, cryo-SEM, cryo-TEM,...), thermal and electrical conductivities and spectroscopic techniques. The final aim is to produce porous polymer samples with different structures, low thermal and high electrical conductivities. The effect of the structure on the properties will be evaluated in collaboration with an engineer and a PhD student.



References:

[1]Q. Weinbach, L. Biniek et al, Front. Electron. Mater. (2022) 2:875856. doi:10.3389/femat.2022.875856.

[2] Q. Weinbach, L. Biniek et al, J. Mater. Chem.C (2023).
https://pubs.rsc.org/en/content/articlelanding/2023/tc/d3tc01110k

Requirements & Application

We are looking for motivated and creative team-worker master student willing to learn with fun about polymers processing, scanning electron microscopy, and thermal conductivity. The candidate is expected to be at ease with physical-chemistry of polymers and not afraid of multidisciplinary field.

Please address your application including a CV, a motivation letter and Master transcript of records to Laure Biniek, SYCOMMOR Team, Institut Charles Sadron.