ITI HiFunMat Master Internship Proposal

☐ M 1 ☒ M 2

Title: Synthesis and characterization of anisotropic semiconducting polymer thin films for organic electrochemical transistors

Internship supervisor

Name, first name	Bardagot, Olivier
E-mail, Telephone	olivier.bardagot@cnrs.fr
Laboratory	ICPEES
Collaboration with a HiFunMat member (*please indicate their name*)	☐ No ☒ Yes : Martin Brinkmann, 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

The main task of this M2 internship, for student registered to the Graduate School, is to manufacture and characterize polymer thin films with increasing molecular order (porosity and alignment). The goal is to find the optimal compromise between high electrical conductivity and fast doping kinetics to enhance the performance of organic electrochemical transistors (OECTs). OECTs are a fast-growing technology used mainly for heath applications (e.g.: biosensors, electrophysiologic devices). The student will work on this hot topic in a pluri-disciplinar team including another M2 student and be supervised by a young researcher eager to share its scientific interests. High quality results are expected, as demonstrated by our manuscript reporting record OECT performance for highly aligned polymers (10x higher than state-of-the-art), currently under review for publication in Nature Materials (https://www.researchsquare.com/article/rs-3221543/v1).

Daily work will include:

- Bibliographic study of the impact of porosity/polymer alignment in the electrochemical doping kinetics of semiconducting polymer thin films
- Processing of semiconducting polymers in solution
- Casting of these solutions in air under a controlled atmosphere (humidity, temperature) and potentially in a glove box
- Scanning electron microscopy (SEM) to visualize the resulting thin films
- OECT manufacture
- Electrical characterization of electrochemical transistors (transfer, output)
- Time-resolved Vis/NIR absorbance spectroscopy during electrochemical doping
- Data analysis using Python (computing)

Hard skills which will be learnt:

- Bibliographic search
- Database management
- Semiconducting polymer design
- Polymer processing
- Vis-NIR absorbance spectroscopy
- Electrochemistry
- Computing (Python for heavy data analysis and graph plotting, LabVIEW if interested)

Soft, transferable, skills which will be learnt:

- Collaboration, teamwork
- Effective communication
- Scientific data presentation (oral and written in English)
- Project management (time management, supply management, etc)
- Progress reporting
- Creativity/independency (depending on the will of the student)