PhD project

Development of electroactive polymers for biomedical devices

36 months doctoral contract, starting in November or december 2024

- **Host Laboratory** *:* Laboratoire de Physicochimie des Polymères et des Interfaces (LPPI) – CY Cergy Paris Université (https://lppi.cyu.fr/)
- **Scientific topics**: polymer materials, chemistry, electrochemistry, biomedical devices

- **Project :**

Hearing loss affects a growing number of people around the world. For patients with severe to profound deafness, placement of a cochlear implant is often necessary. A cochlear implant is an electronic device that will electrically stimulate the departure of the auditory nerve and restore sound sensations. This hearing device is made up of two parts, an internal part surgically implanted in the cochlea and an external part, which is the speech processor, which captures sounds and connects them to internal elements. Due to the size and flexibility of the implant, its manual insertion into the cochlea (spiral shape) by the surgeon is very careful and difficult with incomplete insertion or insertion failure in nearly 30% of cases.

In collaboration with a biomedical company, the ANR PRCE ACCESS project aims to develop a new generation of cochlear implant whose curvature could be electrically controlled by the surgeon, thus facilitating its insertion and the chances of success of the intervention. This objective involves the development of biocompatible electrostimulable materials based on electronically conductive polymers capable of deforming in flexion under low voltage stimulation (~1V). This family of materials has been studied for many years through a collaboration between the LPPI (CY Cergy Paris University) and the Institute of Electronics, Microelectronics and Nanotechnology (IEMN, Lille) and was initially developed for microrobotics. As part of this project, the surface of the implant will be directly functionalized using electronically conductive polymers in order to make the implant electrocontrollable.

This project offers the doctoral student the opportunity to work in a multi-disciplinary research project in the field of biomedical devices. He/she will develop knowledge and skills in polymer chemistry and electrochemistry within the LPPI as well as manufacturing of advanced components and systems in the fields of microsystems and bioMEMs within the IEMN MicroNanofabrication platform. Indeed, stays at IEMN will be planned to apply the synthesis developed at LPPI to the fields of microfabrication. The doctoral student will also participate in project progress meetings by presenting the obtained results, which will strengthen communication skills. He/she will also interact with the academic and industrial partners of the project.

- **Research environment:**

The recruited PhD student will be enrolled in the doctoral program of the doctoral school Science and Engineering at CY Cergy Paris Université (https://www.cyu.fr/english-version). LPPI gathers 20 staff researchers and between 20 to 30 PhD students and postdocs in a motivating and innovative environment. The team is the result of collaboration between chemists, electrochemists, physico-chemists of polymers and of surfaces and interfaces. LPPI has an internationally recognized experience in the development of electroactive polymers, soft actuators and sensors, especially based on the synthesis and combination of electronic and ionic conducting materials.

- **Candidate profile.**

With a master or engineering degree in polymer (physico)chemistry and/or electrochemistry, the highly motivated candidate will have an excellent scientific level, a strong multidisciplinary interest

and a good adaptation capacity. The candidate must also have excellent communication skills in English but french language would be an advantage.

- **Gross salary :** 2 100€ in 2024, 2 200€ in 2025, 2 300€ in 2026

How to apply (Limit date for application 27 Sept 2024) :
Send detailed resume, motivation letter and master degree marks to :
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