# INTERNSHIP OFFERING – Master 2

*Study of the charge transport in ultrathin molecular films*

**Location & lab:** Laboratoire de Réactivité de Surface (LRS) at Sorbonne Université – Paris

**Contact person:** Vincent VIVIER vincent.vivier@sorbonne-universite.fr

**Collaboration with:** Kieu NGO, Julien REBOUL, and Mireille TURMINE at LRS, and Jean-Christophe LACROIX and Pascal MARTIN at Laboratoire ITODYS (Université Paris Cité).

## Research project

Molecular electronics is a scientific field based on the use of π-conjugated material deposited as monolayers or in single-molecule devices in which charge transport is mainly controlled by off-resonant tunnelling. In this operating regime, the response of the devices depends essentially on the thickness of the layer, but hardly varies as a function of molecular structure. By synthesizing multifunctional redox-active molecular films with thicknesses ranging from 5 to 20 nm, and by exploiting phenomena not available with conventional silicon technology, in particular ultrafast movement of ions in ultrathin layers, we aim to develop new electronic and optoelectronic functions.

The objective of this work is to **study the dynamics of electronic and ionic transport in different redox active layers** synthetized at ITODYS. **Impedance spectroscopy** will be the key experimental technique, with the main objective being to determine changes in device behaviour caused by ion motion, and to assess the rate of ion transport. Additionally, this technique will provide the dielectric properties of the device at various operating potentials and various thicknesses (the dielectric function varies with the thickness of the layer when the nanometre scale is reached). It will also provide a direct measurement of the interfacial capacitance, thus allowing the deconvolution of the double layer contribution generated at each electrode/molecule interface or between two successive layers. The control of the synthesis of the layers will allow to tune their thickness, surface, and properties to discriminate between the capacitance of the interface and that of the bulk of materials.

## Applicant profile

- Student in 2nd year of Master or 3rd year of engineering school with a good background in physical chemistry and electrochemistry and/or material science
- Autonomous, meticulous, rigorous
- A good level of English is required

**Internship period:** Ideally from mid-January 2024 for 6 months
**Applications:** Send CV + covering letter + grades for the year Bac +4

**Possibility for a Doctoral thesis:** Yes (ANR project involving ITODYS and LRS)