Post-doctoral project

"Organic monolayers for ISFET sensors"

Context / objective of the research project:

ISFET (Ion Sensitive Field Effect Transistors) are integrated electronic devices for the detection of ionic species in solution. In recent works exceptional performances were demonstrated in terms of sensibility (Limit of detection (LOD) in the attomolar range) for the detection of alkali ions in solution, with devices integrating – as *dielectric gate* and *sensing* layer – a lipid monolayer functionalized with specific ionic probes.[1] Surprisingly, within the range of the very low concentrations, unexpected variations of the surface potential are measured macroscopically that cannot be explained solely by the charge variations associated to the very small number of ion – probe complexation events on the surface of the device.

Within the frame of an ANR project (project ANR-24-CE09-0367-03 "AMPLI") the objective is to investigate the possible existence of the propagation of structural rearrangements at molecular scale, that might be at the origin of an amplification of the surface potential variation induced locally by a single ion-probe complexation event.

[1] T.P. Nguy et al., Sensors and Actuators B: Chemical 2022, 351, 130956.

Activities / Missions of the post-doctoral fellow

- Realization of organic monolayers with controlled architecture / structural properties by molecular grafting or self-assembly on semiconductor surfaces, using chemical processes in solution
- Characterization of the organic monolayers (chemical composition, structural properties) by ATR-FTIR spectroscopy and Atomic Force Microscopy (AFM).
- Macroscopic and local measurement of surface potential by electrochemical techniques or Kelvin Probe Force Microscopy (KPFM).

Recruitment conditions

- Employer: CNRS
- Fixed-term contract, duration 24 months within the period Nov. 2025 –April 2028.
- Gross salary ~3000 euros / month
- Workplace
  - Laboratoire de Physique de la Matière Condensée, Ecole Polytechnique, IP de Paris, Palaiseau, France
  - Short time missions in CINaM at Marseille, France

Candidate profile / skills

- Young scientist with PhD in material sciences, material physico-chemistry or related disciplines
- Background / skills in the field of surface chemistry, surface functionalization, organic monolayer, (ultra) thin layers, electrochemistry
- Skills in surface characterization techniques. Experiences in FTIR spectroscopy and/or AFM would be very beneficial for the project advancement.
- Interest for and experience of instrumental developments
- Adaptability to different working environments

Application

- *Contact :* Catherine.henry-de-villeneuve@polytechnique.edu

- *Documents to provide*: detailed CV, motivation letter, recommendation letters or contact references