



Imperial College
London



Fully funded PhD for EU, UK or international Students

PhD Studentship:

We have available a three year PhD studentship, one of two positions funded by the *Imperial College-CNRS PhD joint programme* project. This position will be localized in the *Switchable Molecules and Materials* group at the Condensed Matter Chemistry Institute of Bordeaux, but will be co-supervised by Dr. Patrick Rosa (ICMCB) and Prof. Sandrine Heutz, Department of Materials/London Centre for Nanotechnology at Imperial College London.

Deadline: 15 July 2021

Start date: 1st October 2021.

Funding available:

The studentship will consist in the standard 1700€/month salary at CNRS laboratories. Registration will be at University of Bordeaux but funding includes mobility costs for extended visits to London for the project, which are required over the 3 years duration of the programme.

Research project: Achieving switchable molecular devices through nanoscale engineering of functional substrates

Molecular semiconductors are gaining increasing traction as a platform on which to build future technologies. Organic light emitting devices are capable of producing the brightest, lightest and most flexible TVs, organic solar cells are reaching efficiencies competitive with silicon, and molecular spintronics could revolutionise the energy efficiency and miniaturisation of communication devices. These achievements are however contingent on the ability to characterise and manipulate key properties in the molecular materials at the macro- and nanoscale. For spintronic applications, spin crossover compounds are unique, as they provide multi-addressable molecular switches that can be triggered by light, temperature or electric fields, which do not only present a change in their electronic structure but also in their magnetic properties.

This project will focus on advanced scanning probe microscopy (SPM) techniques, thin film growth and functional characterisation to address key challenges of molecular electronics, spintronics and barocalorics. It will rely on complementary expertise at Imperial College London, the London Centre for Nanotechnology (LCN) and the Condensed Matter Chemistry Institute of Bordeaux (ICMCB) to create a platform that will be applicable to molecular semiconductors, spin-crossover (SCO) molecules, and molecular magnetic films, therefore transferring knowledge and expertise across fields that have so far mainly evolved in parallel.

The first challenge will be the need to control the orientation, location and thin film growth of semiconductor and SCO molecules on substrates. The second challenge will be the understanding of fundamental properties such as charge and exciton transport in molecular materials at the nanoscale. The third challenge will be using (patterned) ferroelectric substrates and oriented molecules as substrates for the deposition of functional thin films for the creation of multifunctional devices. Such substrates will (1) address the quenching of the spin-state conversion in SCOs deposited directly onto some metallic electrodes; (2) allow to select optimised orientation and location of molecular semiconductors and SCOs; (3) dynamically modify the properties obtained in (2) through post-growth poling.



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The project will involve yearly visits of PIs and the two PhD students funded by the project to the partner institutions. These visits will be timed during periods of student exchange, and/or when conferences/workshops will be attended at the destination institution.

Eligibility:

- Applicants should have or expect to gain a Master degree or equivalent, preferentially in Chemistry or Physics, with emphasis on one or some of the following fields: Coordination Chemistry, Surface Chemistry, Chemistry of Materials, Chemistry of Interfaces, Solid State Physics
- Open to EU nationals or non-EU students, pending vetting by national authorities in France and UK, since extended stays in both countries will be effective during the programme.

Application Procedure:

Applications must be submitted directly to the PI by mail (patrick.rosa@icmcb.cnrs.fr). Please note that you are expected to provide personal details: education and employment history, supporting documentation such as Curriculum Vitae, transcripts of results. Recommendation letters, preferentially from academic sources, are strongly advisable. Fluency in either French or English is compulsory. Mastering both languages will be considered a bonus. Upon consideration of written applications, interviews will be held for shortlisted applicants.



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