

PhD Studentship – 4 Years

Functional Supramolecular Self-assembly at Surfaces

We are seeking to recruit a 4-year PhD Student to join a highly motivated multidisciplinary and international research team working on supramolecular self-assembly at surfaces. The student will be based at the Department of Chemistry of the University of Warwick and work under the supervision of Professor Giovanni Costantini. The studentship provides UK tuition fees and an annual tax-free stipend at Research Council rates (£13,726 in 2013/14). Funding will be for four years of full-time study (+3 Scheme), starting as soon as possible.

Background

Supramolecular self-assembly has come to prominence in recent years as the most promising and most likely route to molecular nanofabrication in the sub-10 nm regime. In fact, organic molecules are among the best candidate “bricks” for future nanoscale device fabrication thanks to the ease by which their chemical structure can be modified to incorporate specific functionalities. Recent transformational materials based on a molecular approach include graphene and graphene nanoribbons, active layers in organic electronics and photovoltaic devices and new types of highly selective heterogeneous catalysts. However, to develop a practical technology, thorough understanding and control over molecular assembly must still be significantly improved. This requires a precise investigation of the structural and electronic properties of adsorbed molecular structures down to the individual molecular level. To this aim, one of the best strategies is represented by a concerted approach where high resolution scanning probe microscopy and photoelectron spectroscopy are combined with state of the art synthetic chemistry and with the ultimate predictive power of density functional theory and molecular dynamics simulations. This path will be followed in the present project to address several topics at the forefront of 2D supramolecular research.

Research Objectives

You will work within a multidisciplinary collaborative project involving three international leading groups with expertise in high resolution structural and electronic characterization (Costantini, University of Warwick, UK), novel functional synthetic chemistry (Bonifazi, University of Namur, Belgium) and advanced theoretical investigation (De Vita, King’s College London, UK). In particular, you will use state of the art experimental equipment including organic molecular beam deposition (OMBD), scanning tunnelling microscopy (STM) and photoelectron spectroscopy (XPS and UPS) facilities to investigate the use of isostructural and isoelectronic substituents of extended polycyclic aromatic hydrocarbons for the fabrication of new functional 2D materials, the surface-confined synthesis and characterisation of covalent polymers and the interplay between supramolecular self-assembly and charge transfer at metal-organic interfaces. A very close teamwork is programmed between the three groups with various occasions for collaboration and exchanges. Measurement campaigns at UK and overseas synchrotron facilities are anticipated.

We are looking for someone who has:

Essential:

- a high motivation and a strong work ethics;
- the ability to think creatively and to work both independently and as part of a team;
- an excellent master’s (or equivalent) degree in physics, chemistry or material sciences;
- outstanding interpersonal and communication skills;
- the ability to give effective presentations and to write reports of high standards;
- strong experimental skills;

Desirable:

- experience in scanning probe microscopy;
- experience in photoelectron spectroscopy techniques;
- experience in vacuum technology and surface science;
- a record of success in published papers.

We expect that the proposed programme will be of very high impact and we are seeking an enthusiastic and committed person to join our research team.

Location and Environment

You will be working in the research group of Professor Giovanni Costantini, which is part of the Physical Chemistry Research Cluster/Section in the Department of Chemistry at University of Warwick. The project will be conducted in collaboration with an extended and experienced multidisciplinary research team. Further information on the Costantini group can be found at:

<http://www2.warwick.ac.uk/fac/sci/chemistry/research/costantini/costantinigroup>

How to apply

Applicants are required to provide:

- academic CV;
- official full list of courses and marks from your university;
- contact details of two suitable referees;
- cover letter outlining your suitability for the study and your research experience to date.

Applications should be emailed to: g.costantini@warwick.ac.uk. The successful candidate will be required to submit a full University of Warwick on-line application to fulfil the normal admissions process. Any enquiries relating to the project and/or suitability should be directed to Giovanni Costantini at the address above.

Awards available: 1 award available

Funding Details: Fees and Maintenance at the RCUK level (£13,726 / year)

Length of Award: 4 years (PhD)

Eligibility: Available to UK, EU and Overseas students

Application Details: Informal enquiries may be directed to Professor Giovanni Costantini (g.costantini@warwick.ac.uk).