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Université Sorbonne
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SENTINEL

European Training Network in Single-Entity NanoElectrochemistry

Early stage researcher opportunity based at the
University of Paris Diderot

Le laboratoire Interfaces Traitements Organisation et DYnamique des Systèmes (ITODYS)

Co-supervised by

University of Warwick

Project Description

ESR8: Opto-Electrochemical Nanoscopy of Single Electrocatalytic Nanoobjects

Objectives: To identify but most effective ways of using an optical nanoscope to image and quantify (electro)chemical processes at high throughput nanoscale by tracking simultaneously (i) the position and (ii) the optical or spectroscopic responses of individual nanoparticles in an (electro)chemical environment.

Expected Results: These new ways of using the nanoscope will allow a unique quantitative optical inspection of electrochemical processes at <10nm nanodomains with high time resolution (Elements) and high throughput. Such complementary visualization will deepen the electrochemical description of electrocatalysis at individual nanoparticles (Warwick, Utah).

Planned Secondments:

- University of Warwick - modelling of interfacial properties at the nanoscale. The ESR to will gain hands on experience of finite element method modelling (COMSOL platform) to treat experimental data and for experimental design.
- University of Utah - single nanoparticle delivery and analysis. The ESR will be exposed to a recently developed technique that allows for the controlled delivery of single particles and molecules to electrochemical interfaces.
- Elements - development of CMOS potentiostats. The ESR will learn fabrication of portable potentiostats using microchips (ASICs) and standard CMOS processes. This novel potentiostat will then be used to study electrocatalysis at the nanoscale and single-molecule delivery.

About the Employer

Université Paris Diderot (UPD) is a leading public research multidisciplinary university in France and a major actor in the European higher education and research area. With its 29,000 students, 19% of whom are international, its 2,500 scientists and its 90 research laboratories, UPD has acquired an international reputation for the excellence of its standards of research in science, medicine, dentistry, humanities and social sciences. Since 2007, UPD has a new campus in a new developing area of Paris. Since 2009, UPD has been part of *Sorbonne Paris Cité*, a consortium of 8 higher education and research organisations aiming to reinforce international attractiveness.

Through its laboratory (ITODYS), the team at UPD has state of the art facilities in nanoelectrochemistry that include 4 low current potentiostats, 3 SECM and various high resolution optical microscopies (holography, Dark-Field, reflectivity, BALM). Also through ITODYS, the ESR will have access to DLS, NTA, SEM, TEM, AFM, or surface chemistry analysis by XPS, Raman, FTIR. The team also has clean room facilities, and other facilities in Paris (Cryo-TEM, HR-TEM). The ESR will have full access to the University campus facilities including restaurants and sport facilities. Along other PhDs or postdocs at the University, the fellow will participate in research seminars and training sessions from the chemistry and physics departments, as well as to generic skills training offered by UPD's Learning and Development Center or by surrounding institutes who the ESR's supervisor is connected with. The Division for the Support or research and Innovation (DARI) will act as an interface with all University's services.



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