

PhD position in Synthesis of Photo-electrocatalysts for CO₂ conversion in the Field of Artificial Photosynthesis

InterMat aims to approach solar cells and novel catalysts to their uses in CO₂ conversion photo-electrocatalytic systems to mimic photosynthesis. On the one hand, it will focus on the investigation of the interface between the nanoscale semiconductor layers, deposited using solution processed techniques, in these thin film solar cells to reduce non-radiate charge recombination processes and maximize the solar cell efficiency. Furthermore, it will study the photo-electrocatalytic reactions at the surface of the organic or inorganic nano/micro-structured semiconductor electrodes used in the photo-reactor for the reduction of CO₂ into solar fuels.

How materials work-function changes, the interfacial charge transfer reactions that limits the devices theoretical maximum efficiency for CO₂ conversion, the mechanism for charge accumulation and charge transport across the interface are still unresolved challenges to achieve a quantum leap in efficiency in earth abundant and novel solution process photo-electrocatalytic systems for CO₂ catalysis.

The primary motivation for the project is well defined: **InterMat** will provide the knowledge to achieve higher efficiencies through the study of the interface optimisation and the understanding of the interfacial charge transfer reactions in operando conditions.

The challenges presented at **InterMat** are great, but the potential rewards are enormous. Much effort on the basic research science must be carried out to succeed on the great challenge of increasing the photo-electrocatalysis efficiency and stability in this new type of solar driven photo-eletrocatalysts to make them competitive in CO₂ conversion. To tackle this challenge, we will make use of advanced experimental techniques already developed by Prof. Emilio Palomares group during the previous ERCstg project (PolyDot) and the knowledge of Prof. Laurent Billon (Bio-inspired materials group: functionality & self-assembly at Université de Pau et des Pays de l'Adour/Energy & Environment solutions UPPA/E2S, France).

InterMat will have a key impact on the field bringing paramount breakthroughs in the use of modified interfaces leading to the optimization of novel thin film solar cell efficiencies and novel organic/inorganic catalysts for CO₂ photo-electrocatalysis.

MAIN RESPONSABILITIES

The project has its focus on the synthesis and characterization of photo-electrocatalysts for CO₂ conversion.

The successful candidate will contribute to the following tasks:

- Synthesis of molecules and molecular materials for active electrocatalytic reduction of CO₂
- Development of a photo-electrocatalytic devices working in operando conditions for solar-driven chemistry
- Measurement and analysis of C1 and C2 products derivated from the electrocatalytic reduction of CO₂

The chosen candidate will complete a PhD with an inter-disciplinary supervisory team and benefit from a world-class training programme. The PhD will be completed at IPREM (UPPA CNRS UMR 5254 – E2S, Pau, France) with short stays at ICIQ (Tarragona, Spain).

QUALIFICATIONS

- Master's degree in chemistry, material science, or related disciplines
- Strong interest in material science and advanced inorganic/organic and polymeric synthetic skills
- Interested in the catalytic and electrochemical characterization of the functional materials
- Strong interest in interdisciplinary scientific work
- Strong motivation to pursue a PhD degree and to develop a cross-disciplinary cutting-edge project
- Excellent communication skills and willingness to work in collaborative projects with multiple partners
- Very good English language skills
- Self-motivation and the ability to achieve goals independently as well as to contribute effectively to the team
- Willing to travel within the EU
- Familiar with environmental, health and safety (EHS) requirements.

RECRUITMENT CONDITIONS

The student will be employed by UPPA (France), with a gross salary of 1878 € (UPPA doctoral contract, according to E2S UPPA project, including 96h of teaching during the three years).

Successful applicants will be required to start latest 1 December 2019 for a period of 3 years.

Any appointment will be conditional upon satisfactory references, the fulfilment of any conditions specified in the offer of a place on a PhD programme, and confirmation of the right to work in the EU and ability to secure a valid visa.

Selections will be made regardless of gender, nationality, religion, ethnicity and cultural background.

SELECTION PROCESS

A first selection process will consist of a screening of the curriculum vitae, academic course transcripts, a motivation letter and 2 recommendation letters. The short-listed candidates will be interviewed by teleconference/skype by the selection committee. The selected candidate will be approved by the selection committee.

Application files will be evaluated based on the following criteria:

- Grades and ranking during the Master degree, steadiness in the academic background
- English language proficiency
- Candidate's ability to present her/his work and results

APPLY FOR THIS JOB

Send your application (CV, motivation letter, 2 recommendation letters together with academic course transcripts, all documents should be in English) with the title "InterMat doctoral application" to the following address: palomares-gil.e@univ-pau.fr

The closing date for receipt of applications is **November 1st 2019**, 17:00 Paris Time (CET or GMT+1)