UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR
COLLÈGE STEE
SCIENCES ET TECHNOLOGIES POUR L'ÉNERGIE ET L'ENVIRONNEMENT

IPREM
Institut des sciences analytiques et de physico-chimie pour l'environnement et les matériaux

e2s UPPA
energy environment solutions

# Postdoc Position

## Photo-reforming of industrial wastes into value-added products over visible-light-absorbing catalysts

### CONTEXT - SCIENTIFIC FRAMEWORK

**EnSuITe** aims at bringing Green Hydrogen Generation from bio-inspired research to a higher technology readiness level (TRL1 to TRL4) addressing issues as the sustainability of the materials used, the design of the devices available and the consumed energy of the electrolyser, that current existing technology presents.
Moreover, in a holistic approach, EnSuITe will gather together the technological research with a social dimension to tackle legal, economic and social topics to make GHG and use a real, sustainable energy solution for isolated and solidarity territories. These first studies in isolated communities will give a sight of the potential implementation in larger and complex territories.
EnSuITe is a collaborative project between Science & Technologies (IPREM) and Social Sciences & Humanities (TREE) Departments of the UPPA.
Bio-inspiration will be the project's guideline. At the technical level, integrating such concepts implies to take profit of the thousand-years-old evolution report of the animal and plant kingdom with their environment, around 3 inseparable major pillars: (1) chemical composition to lead to features, (2) molecular or macromolecular structure to create elementary building blocks, and finally (3) hierarchical architecture of materials combined to the processes of the elementary building blocks self-assembly, to promote and enhance properties of the living entities "devices" allowing in a way or in other one to favour their development and then Life diversity.

### MISSION - MAIN ACTIVITIES:

In this Research Engineer position, you will work on the optimization of photo-reforming of bioresources from local paper/food industries (Landes forest in South West of France) or plastic waste into value-added products, *i.e.* Hydrogen.
Photo-reforming (PR) is one of the options for new technologies with the aim to reduce societal, economic and environmental repercussions across the globe. In PR, electrons in a semiconductor are excited to the conduction band (CB) by sunlight and reduce water to H2, while the photogenerated holes in the valence band (VB) drive the oxidation of an organic substrate, *i.e.* industrial waste products. Such combined processes can be considered as a hybrid process between photocatalytic water splitting and organic photo-redox catalysis. As no external energy input beyond sunlight, PR has several unique benefits, as applicability to small and local off-grid systems and ability to produce pure, fuel-cell-grade H2.
The utilization of carbon-based photocatalysts, *i.e.* fully or artificial metallo-enzymes, for PR of different industrial organic wastes will offer new perspectives for clean H2 fuel production to extract valuable chemicals from the oxidation process in future development. The present PR process will operate under room-temperature with benign aqueous conditions (pH ≈ 2−15) without the need for toxic components. These carbon-based photocatalysts are currently develop by the Ensuite team

composed with 2 PHD and 2 Postdocs, and will serve as a proof-of-concept for the ability of photo-reforming to address two global challenges: impact alleviation of industrial wastes and renewable fuel production.

**POSITION AND ASSIGNMENTS**

The position has its focus on the uses and valorization of local industrial wastes by their photo-reforming from Ensuite catalyst.

The successful candidate will contribute to the following tasks:

- Synthesis of carbon-based photocatalysts, *i.e.* fully or artificial metallo-enzymes,
- Photo-electro catalytic activities,
- Development & processability of flow-cells under light illumination.

The position will also include international travel to conferences and meetings with partners/collaborators.

**WORKING CONDITIONS**

The chosen candidate will be working with an inter-disciplinary supervisory team (IPREM and TREE (UPPA-France) with collaboration with MPG (Germany), ICIQ (Spain), POLITO (Italy) and others ...

**Hosting laboratories:**

IPREM, UMR CNRS 5254, Université de Pau et des Pays de l'Adour, Pau, Nouvelle-Aquitaine, France.

IPREM is a joint Research Unit CNRS/UPPA (UMR 5254) in France. IPREM has an extensive and highly competitive research program that comprises the development of fundamental knowledge in physical-chemistry, analytical chemistry and synthesis of functional/bio-inspired materials, in relation to conversion and electrochemical/chemical storage of renewable energies.

EnSuITE research project is led by Pr. 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).

**Localisation addresses:**

IPREM, Université de Pau et des Pays de l'Adour, Pau, Nouvelle-Aquitaine, France

**Starting period:** asap.

**Duration of the contract:** 18 months.

**Gross salary range:** 2800-3000 €/month (which includes extra gratification for teaching duties – 64h/year)

**Funding:** This position is funded by the project E2S UPPA (Energy Environment Solutions) which has a core scientific domain focused on Environment and Energy to meet challenges related to the energy transition, geo-resources, aquatic habitats and the environmental effects of natural and anthropogenic changes.
https://e2s-uppa.eu/en/index.html

## APPLICANT'S PROFILE

Priority will be given to candidates holding a PhD degree in ElectroChemistry as major. The candidate should be interested in the catalytic and electrochemical characterization of functional materials and their application for photo(electro)catalytic hydrogen evolution.

Extensive experience in experimental research in molecular and supramolecular chemistry, structure-property relationships, catalytic and electrochemical characterization of functional materials is desirable.

The applicant must be proficient in spoken and written English. French knowledge would be desirable, but non-mandatory.

The ranking will also accord weight to the candidates' assessed competence in their ability to interact and communicate effectively in a multi-disciplinary and multi-national research environment.

## APPLICATION – EVALUATION CRITERIA

Candidates will first be selected based on their application file.
Those selected after this first step, will then be interviewed, by teleconference/skype by Pr L. BILLON.
Application files will be evaluated based on the following criteria:

- Appropriate education and work/research in related fields.
- English language proficiency
- Candidate's ability to present her/his work and results
- Candidate's motivation, knowledge, scientific maturity, and curiosity.
- Emphasis will also be placed on personal skills.
- Work experience in a laboratory – or likewise; previously achieved research work (reports, publications).

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

**Application will include:** *(in a single pdf file)*

- CV
- Cover letter
- Master's degree grade transcripts and ranking
- 2 Reference letters
- Contact details of at least two people, from you work environment, who can be contacted for further reference

## APPLY FOR THIS JOB

Send your application (CV, motivation letter, 2 reference together with copy of the candidate's PhD thesis diploma) with the title "ENSUITE – Research Engineer application" to the following address: laurent.billon@univ-pau.fr
For more details, please visit our websites: http://e2s-uppa.eu/en/index.html