Post-doctoral position
Development of dye sensitized photocatalytic systems for solar driven hydrogen production without sacrificial reagent

Field	Artificial photosynthesis, solar fuels
PI	Fabrice ODOBEL
Host laboratory	CEISAM-UMR CNRS 6230 at Nantes University (FRANCE)
Starting date:	ASAP, May or June 2022 for 12 months
Contact	Fabrice.Odobel@univ-nantes.fr

Offer description:

The perspective of using dihydrogen as a clean energy carrier in the future has stimulated scientists toward the development of cheap, and eco-compatible processes for green H_2 production from renewable sources. Artificial photosynthesis is the process that enables the production of energy-rich chemicals directly from abundant feedstock such as water into hydrogen (H_2) using sunlight, which is the largest renewable energy source.

This **project aims at developing original dye sensitized photocatalytic systems (DSPs) in water for H_2 evolution** using TiO_2 nanoparticles whose surface is coated with a hydrogen evolution catalyst **along with a photocatalyst for simultaneous biomass upgrading into added value carbonyl derivatives**. Currently, all current DSPs operating in solution use sacrificial electron donors (SEDs) to operate, but in this project we will make a breakthrough by eliminating the SEDs thanks to the selective oxidation of alcohols. This project capitalizes on our preliminary unpublished results showing that DSPs can effectively reduce water into hydrogen while selectively oxidizing alcohols without any SED. This multi-disciplinary project is addressed by two different groups. The group of Dr. Fabrice Odobel in CEISAM laboratory at Nantes University will prepare the molecular building blocks and

Figure. Schematic representation of the targeted system

undertake the photocatalytic tests and the group of Prof. Eric Vauthey at Geneva University will conduct a comprehensive photophysical study of the photocatalytic systems. The host group of Dr. F. Odobel, has a broad expertise on the design, synthesis and characterization of molecular systems for artificial synthesis and recent publications are *e.g.: Nature Commun.* **2020**, *11*, 3499; *ChemSusChem* **2021**, *14*, 2902; *ACS Catal.* **2021**, *11*, 12075; *ACS Appl. Energy Mater.* **2021**, *4*, 2629; *Chem. Sci.* **2019**, *10*, 2758.
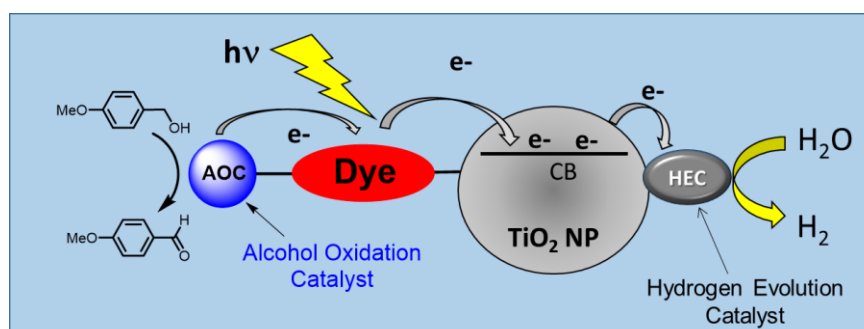
Skills/Qualifications :

The main aim of the project will be to design and develop novel molecular dyes and catalysts that will be assembled on the surface of TiO_2 nanoparticles to evolve hydrogen and concomitantly oxidize biomass derivatives. The candidate will be exposed to an interdisciplinary project requiring the realization of the following tasks:

1- Synthesis and characterization of molecular photocatalysts (dye and catalysts) requiring organic synthesis and coordination chemistry.

2- Optimize the experimental conditions for hydrogen evolution and alcohol oxidation reaction with the synthesized photocatalysts (quantification by gas and liquid chromatography).

3- Presentation of results at progress meetings with the consortium.

4- Writing of reports (bibliography and experimental results).

We are particularly interested a young scientist holding a PhD degree with experience from research areas within photocatalysis for hydrogen production, CO_2 conversion who is familiar with photocatalytic tests and skilled for molecular synthesis. Competences in photoelectrochemistry are also of interest.

The candidate should be self-motivated and able to conduct fast paced research and work independently in a team-oriented environment. The researcher will be hosted in a friendly group and should be ready and happy to participate in team work.

To apply (and/or for more information), please send a cover letter outlining your motivation, a complete CV with the list of publications and at least two references to Dr. Fabrice Odobel (fabrice.odobel@univ-nantes.fr).

Benefit:

As an employee in France, you will have full access to an optimal health service.
The average net salary is about 2400 € per month depending on the experience.