Aix*Marseille université

École Doctorale des Sciences Chimiques ED250

Contrats Doctoraux **2022**

**PhD title :** Design of Supported Catalysts for Hydrogen Production

**Laboratory** : Institute of Molecular Sciences of Marseille
**Team** : BiosCiences
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**- Project**

The development of renewable energy sources is of crucial importance in the face of the energy challenge of the 21st century. As **hydrogen** is considered as an energy carrier in the search for fuels of the future, the design of catalysts for the production of hydrogen is fundamental to developing abundant, inexpensive and environmentally friendly renewable energy sources. In recent years, a large number of molecular catalysts have been developed and considerable effort has been devoted to designing Earth-abundant transition metal complexes. In the laboratory, we have developed a series of **molecular complexes** that exhibit high catalytic activities for the reduction of protons to hydrogen, which makes these systems competitive among the most efficient catalysts described in the literature. After having shown that this system was capable of efficiently and selectively converting protons into hydrogen electrochemically (in the presence of current) or photochemically (in the presence of light energy), we aim to combine these catalysts with a material of the type conductive polymer to assess their ability to carry out the hydrogen production reaction within a solid matrix. This project aims to include **catalytic centers in a solid matrix**, in order to make them stable and economically profitable electrodes for producing hydrogen by electrolysis in an aqueous medium. Our first results have shown the relevance of combining a molecular catalyst with a solid matrix based on polymers to develop efficient bio-inspired catalytic systems for the electrochemical and photochemical conversion of protons into hydrogen. The ultimate ambition of this project is to design new **innovative eco-compatible supported catalysts** with the aim of reproducing the impressive reactivity of the biological system that is the enzyme hydrogenase in order to solve the problem of finding new sources of energy. alternatives and to direct an energy transition towards another model in order to put an end to our dependence on fossil fuels. This project will be developed under a Region contract (CAPH2, 2022-2025).

**- Profile**

Background in organic synthesis, coordination chemistry and electrochemistry, a good knowledge in catalysis and spectroscopy will be appreciated.

**- Procedure**

Send a CV and a motivation letter to maylis.orio@univ-amu.fr before **May the 1st of 2022**

**- Bibliography**

1) Chem. Cat. Chem., 2017, 9, 2262-2268 ; 2) Chem. Eur. J., 2018, 24, 8779-8786; 3) Dalton Trans., 2020, 49, 5064-5073; 4) Chem. Sus. Chem., 2019, 12, 4905-4915; 5) RSC Adv., 2021, 11, 5232-5238; 6) Chem. Commun., 2021, 57, 3952.