PhD position: An MCO as ultimate artificial photosynthetic mimic

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A CNRS funded PhD position in the field of artificial photo-synthesis is available at Ism2 (BiosCiences team) starting October 1st 2020.

Electron transfer reactions are of fundamental importance in biological processes like photosynthesis and respiration. Understanding how electrons are transported in these complex systems may help chemists to discover new tools to perform multielectronic sustainable chemical transformations. One way of study is to use light energy to drive natural enzymes for realizing both chemical oxidation and reduction reactions of high importance for our societies.

The multicopper oxidase (MCO) laccase couples the mono-electronic oxidation of organic substrates to the four-electron reduction of dioxygen into water. Such biological tandem oxidative and reductive processes are inspiring the design of hybrid systems for Oxygen Atom Transfer Reactions by *grafting a synthetic sensitizer-catalyst* potentially able to photoactivate \( \text{H}_2\text{O} \) to the surface of an active robust laccase that performs \( \text{O}_2 \) reduction.\(^1\)

In this context, the challenging and ambitious goal of this PhD project is, using light to trigger ET in MCO from discrete surface grafting points, to study the intramolecular ET, the repartition of the electrons on the 4 \( \text{Cu}^{II} \) ions and mechanistic aspects of the \( \text{O}_2+4\text{e}^-+4\text{H}^+-\rightarrow 2\text{H}_2\text{O} \) (reversible) reactions. The system (a fungal laccase) will be studied with state of the art spectroscopic techniques (UV/VIS, EPR, stopped-flow) and laser flash photolysis.

Experiments will be carried out mainly at the Institute of Molecular Sciences in Marseille (iSm2, UMR CNRS 7313, Aix Marseille University). Part of the work (laser flash photolysis) will be carried out at the Photocatalysis and Biohydrogen Laboratory, at the Institute of Biophysical and Structural Biology, UMR9198, CEA Saclay.

We are seeking highly motivated candidates (master or equivalent with honors) with solid training in molecular chemistry and/or biochemistry (chemistry-biology interface). Applications (CV, motivation letter, 2 reference letters, transcripts) are exclusively received via the CNRS job portal (http://bit.ly/2wZEtSl). For any further information contact Dr. Thierry Tron (thierry.tron@univ-amu.fr).

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