One Year Postdoctoral Fellowship in Bio-inorganic Chemistry

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The main objective of this proposal is the development of catalytic systems able to perform selective oxidation of substrates (epoxidation of alkenes, oxidation of alkanes,…) directly using molecular oxygen in water under mild conditions. The current industrial processes for such reactions require harsh conditions, associated with strong oxidants and potentially harmful catalysts. Yet nature has figured out an elegant manner to catalyze such reactions by reductive activation of molecular oxygen at the iron(II) centers present in multi-component enzymatic systems called monooxygenases. These enzymes are made of one catalytic sub-unit containing the catalytic iron(s), and one redox sub-unit providing a steady input of electrons during the catalytic cycle. The development of bio-inspired catalysts, mimicking these enzymes activity, is therefore a promising path for the development of environmentally friendly new oxidation processes. In this context, we recently obtained interesting results in the development of polymeric artificial reductases, capable of collecting electrons from NADH and efficiently reduce metalloporphyrins in water (scheme 1) [*Nat. Commun.* **2015**, 8509]. Such system was very efficient for electron transfer. However, oxidation catalysis in water remained rather poor with such catalyst and we are now seeking for new catalysts capable of activating O_2 efficiently in water.

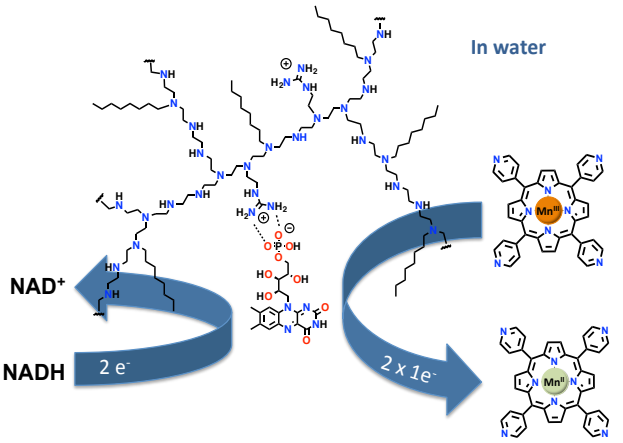

Figure 1. Schematic representation of an artificial flavoenzyme used as a cytochrome P450 reductase.

Interestingly, incorporation of polyoxometalates (POM) in similar PEI polymers appeared to be efficient catalysts for alkene epoxidation in water using H_2O_2. We are therefore planning to incorporate POM in our systems and study their reduction as well as their capability to activate dioxygen in order to perform selective oxidation in water.

One year postdoctoral fellowship is available to work on this project. The successful candidate will be a motivated chemist, with less than three years experience after his/her PhD and interested by working at the chemistry/biochemistry interface. He/she will have good skills in bio-inorganic chemistry and catalysis. Knowledge in electrochemistry and various usual spectroscopic techniques would also be appreciated.