AVIS DE SOUTENANCE DE THÈSE

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Soutiendra publiquement sa thèse intitulée :
Molecular catalysts inspired by artificial metalloenzymes for water oxidation: Bon voyage from homogeneous to heterogeneous catalysis.

Dirigée par Monsieur LAURENT BILLON

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Salle : Amphithéâtre IPREM

Composition du jury :

M. LAURENT BILLON, Professeur des universités	Université de Pau et des Pays de l'Adour	Directeur de thèse
Mme Marie-Noelle COLLOMB, Directeur de recherche CNRS	Université Grenoble Alpes	Rapporteure
M. Patrice WOISEL, Professeur des universités	Université de Lille	Rapporteur
M. Antoni LLOBET, Professeur	Université Autonome de Barcelone	Examinateur
M. Rinaldo POLI, Professeur des universités	Centre national de la recherche scientifique (CNRS)	Examinateur
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Mots-clés : Catalyseurs moléculaires d'oxydation de l'eau, Métalloenzymes artificielles, Photosynthèse artificielle, Production d'hydrogène vert, Polymère Organique Poreux, Catalyse hétérogène

Résumé :

Projected energy demand to power the entire human population by 2050 is in the range of 30 to 50 TW, which is an increase of more than 100% compared to what we consumed in 2004. The use of fossil fuels for energy releases large amounts of CO2, which has catastrophic consequences such as global warming. It is becoming understandable that this effect has a significant impact on our climate change. It is therefore more urgent than ever to develop alternative carbon-neutral energy sources. An attractive and carbon-neutral energy carrier to solve this problem could be H2, but the sustainable source of hydrogen has yet to be found. After billions of years of evolution, nature has developed a system that can capture sunlight and convert light energy into biomass in the process of photosynthesis. The oxidation of water to O2 is the terminal reaction of photosystem II (PSII) in green plants, which takes place at the level of a Ca-Mn4 polynuclear complex, a naturally occurring metalloenzyme. This reaction is thermodynamically demanding and kinetically slow due to the enormous molecular complexity from a mechanical point of view. It is therefore important to mimic efficient low-molecular-weight models that can perform this reaction in the laboratory, called artificial photosynthesis. This thesis focuses on the preparation of a family of bioinspired artificial metalloenzymes based on the metal Ru to achieve artificial photosynthesis. The higher oxidation states of these Ru complexes have been shown to be active in oxidizing water to molecular oxygen, a key reaction to access a clean renewable fuel such as H2, the energy carrier of the future.