Keynote Speakers

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Short Biography

Ally Aukauloo obtained his PhD in porphyrin chemistry in 1994. In 1995 he was elected as assistant professor at Université Paris-Sud, where he worked on molecular magnetism. In 2000, after stay in Pr. J. Collman labs at Stanford University to work on Cytochrome c oxidase models, he started his research on Artificial Photosynthesis. He became full-professor in 2007 in bioinorganic chemistry. He was elected at the Institut Universitaire de France as a senior member in 2021. He focusses on the chemistry of molecular complexes for water activation, CO_2 reduction and organic semiconductors for the water splitting.

Title of Oral Presentation

Nanostructured Organic Semiconductors for the Photocatalytic Water Splitting

Keywords : Artificial Photosynthesis, light capture, charge accumulation, water oxidation , quinone reduct

Abstract of Oral Presentation

The central theme of research in artificial photosynthesis revolves around capturing sunlight to drive the water splitting reaction (WSR), producing O_2 and H_2. While inorganic oxides have traditionally dominated the materials used for this purpose, organic semiconductors have now emerged as an important contender. Both types of materials allow for the synthetic adjustment of band gaps and energies to enable the WSR. However, optimizing the photophysical properties of these semiconductors often requires complex and labor-intensive synthetic processes.

I will discuss on two new findings:

i) A study on a nanostructured semiconducting conjugated polymer, poly(diphenylbutadiyne) (nano-PDPB), and its photocatalytic activity in driving the water oxidation reaction under visible light irradiation when dispersed in water, without the need for sacrificial agents or co-catalysts. Charge recovery, either directly or delayed, was demonstrated through the reduction of quinone, which served as a hydrogen reservoir. In the absence of quinones as electron acceptors, we observed the formation of H_2O_2, resulting from the partial reduction of O_2.

ii) When pyrrole dissolved in distilled water is exposed to high-energy radiation, it forms nanostructured spherical polypyrrole (Nano-PPy) particles, which are characterized as overoxidized polypyrrole. Electrochemical measurements and Tauc's plot analysis reveal that the material exhibits semiconducting properties, with a band gap of approximately 1.8 eV. The conduction band is positioned at around -0.5 V, while the valence band is at about +1.3 V vs NHE. When suspended in water and irradiated with light wavelengths above 420 nm, Nano-PPy induces O_2 evolution.

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