Séminaire du 20 Mai

Le photosystème II : l'enzyme de l'oxydation de l'eau

Alfred W RUTHERFORD

Directeur de Recherches au CNRS CEA Saclay

The water oxidising enzyme of photosynthesis is in large part responsible for converting solar energy into the high energy chemicals that sustain life on the planet and that have accumulated as fossil fuels. This solar-driven enzyme also put the oxygen into the atmosphere thereby making the biosphere aerobic with all the associated repercussions for the planet (O_2-based respiration, multicelluar life, UV screening by ozone etc). It is also perhaps the only catalyst know that is able to oxidise water at close to its thermodynamic optimum. As such it is the focus of much attention with a view to producing bio-inspired catalysts that have potential uses for more efficient (and sustainable) energy conversion processes: such as a) H_2 production by electrolysis or by photolysis and b) in electricity production in fuel cells. The group in Saclay has applied biophysical, biochemical and molecular biological methods to investigate the photochemistry and molecular enzymology of this remarkable enzyme. Current research uses the enzyme isolated from a thermophilic species of cyanobacteria isolated from hot springs in Japan. This provides much more robust and homogeneous material than from other sources. Much of the focus of our attention is on the cluster of metal ions made up of four high valence Mn ions and a calcium ion. In parallel to the biochemical and biophysical studies, we also design, synthesize and study chemical models that are aimed at mimicking certain features of the water oxidising enzyme. These artificial systems could be useful in solar fuel production and in fuel cells. (Supported by EU network Solar H2)