

Title Water-Oxidation Catalysis for Solar Fuel Production

Speaker Prof. Gary W. Brudvig
 Professor
 Department of Chemistry, Yale University
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Date & Time Friday, June 14, 2013 4:00 p.m.

Place I²CNER Hall, Ito campus, Kyushu University

Abstract

Devising cost effective methods for efficiently capturing and storing solar energy is among the grand challenges of science. We are using insights from studies of natural photosynthetic systems to develop bioinspired materials for photochemical water oxidation and solar fuel production. Our progress on the development of synthetic water-oxidation catalysts and their use in materials for artificial photosynthesis will be discussed. In order to use visible light to drive water-oxidation catalysis, we have designed high-potential photosensitizers for functionalization of metal oxide surfaces. In these constructs, the photosensitizer efficiently absorbs visible light and uses the energy to initiate electron transfer to an attached metal oxide. The injected electrons can ultimately be used for CO₂ reduction at a cathode while the resulting holes (sensitizer radical cations) provide the potential needed for a water-oxidation catalyst. We have prepared photoanodes consisting of a high-potential porphyrin sensitizers bearing linkers for functionalization of TiO₂ or SnO₂ nanoparticles. THz studies and photoelectrochemical measurements demonstrate that the photoexcited porphyrin is capable of injecting electrons into both the TiO₂ and SnO₂ conduction bands. Current work is aimed at coupling these high-potential photosensitizers with molecular water-oxidation catalysts on the surface of a metal oxide photoanode for visible light-induced water oxidation.

About the Speaker

Prof. Gary Brudvig is the Benjamin Silliman Professor of Chemistry, Professor of Molecular Biophysics and Biochemistry, and Director of the Yale Energy Sciences Institute. He received his B.S. (1976) from the University of Minnesota, his Ph.D. (1981) from Caltech working with Sunney Chan and was a Miller Postdoctoral Fellow with Ken Sauer at the University of California, Berkeley from 1980 to 1982. Professor Brudvig has been on the faculty at Yale since 1982 and served as Chair of the Chemistry Department from 2003-2009. His research involves study of the chemistry of water oxidation in photosynthesis and work to develop artificial bioinspired systems for solar fuel production

Host: Professor Ken Sakai

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