NANYANG TECHNOLOGICAL UNIVERSITY

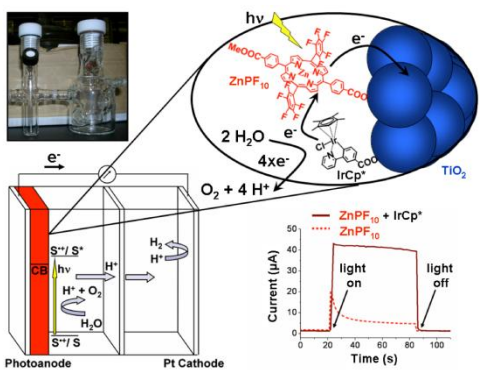
CBC SEMINAR ANNOUNCEMENT

Professor Gary Brudvig
Yale University

Water-Oxidation Catalysts for Solar Fuel Production

Devising cost effective methods for efficiently capturing and storing solar energy is among the grand challenges of science.[1] 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 H_2 production 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 high-potential free-base and zinc *bis*-pentafluorophenyl porphyrin sensitizers (PF_{10} and $ZnPF_{10}$) bearing linkers for functionalization of TiO_2 and SnO_2 nanoparticles. THz studies and photoelectrochemical measurements demonstrate that photoexcited PF_{10} (PF_{10}*) is capable of injecting electrons into the SnO_2 conduction band (CB). In addition, the zinc derivative forms a photoinduced charge separated state on both TiO_2 and SnO_2. Co-deposition of the photoanode with a molecular water-oxidation catalyst (IrCp*)[2] results in a marked increase in the observed photocurrent, consistent with light-induced activation of the catalyst (Figure 1).[3]

[1] *Directing Matter and Energy: Five Challenges for Science and the Imagination*, U.S. Department of Energy, Washington, DC, December 2007.
[2] J. F. Hull, D. Balcells, J. D. Blakemore, C. D. Incarvito, O. Eisenstein, G. W. Brudvig and R. H. Crabtree
J. Am. Chem. Soc. **2009**, *131*, 8730–8731.
[3] G. F. Moore, S. J. Konezny, H. -e. Song, R. L. Milot, J. D. Blakemore, M. L. Lee, V. S. Batista, C. A. Schmuttenmaer, R. H. Crabtree and G. W. Brudvig
J. Phys. Chem. C **2012**, *116*, 4892–4902.



Date:	**14th June 2012 (Thursday)**
Time:	**11:00am – 12:30pm**
Venue:	**NTU SPMS CBC Building Level 2, Conference Room**
Host:	**Assoc Professor Chen Hongyu**