SOLAR QUEST

SEMINAR ANNOUNCEMENT

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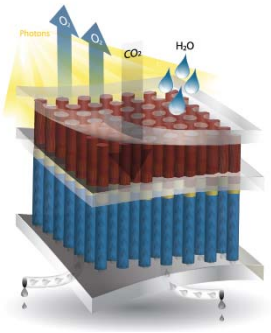

SOLAR FUELS PRODUCTION BY ARTIFICIAL PHOTOSYNTHESIS

DATE: Thursday, March 13, 2014
TIME: 15:00-17:00
PLACE: Seminar Room A-502
CCR Building, 5F

ABSTRACT

A practical method to use sunlight to generate liquid transportation fuels would be a carbon-neutral energy source which could dramatically change the landscape of global energy generation and storage. "Artificial photosynthesis" systems which convert sunlight to energy in the form of chemical bonds are an attractive approach to address this challenge. This presentation will focus on an integrated approach to perform solar driven water splitting to H_2 and O_2 using unconcentrated sunlight.

The minimum potential required to split water into H_2 and O_2 is 1.23 V (values for reducing CO_2 to methanol or to methane are similar). The JCAP photovoltaic approach uses photocathodes (H_2 or hydrocarbon producing) and photoanodes (O_2 producing) linked in a tandem geometry. The photocathode and photoanode provide the same functionality as PS I and PS II in natural photosynthesis.

Photocathode approaches based on nanostructured III-V semiconductors and amorphous Si coupled with metal oxide passivation layers will be presented. Solar to hydrogen conversion efficiencies approach 15% with multiday stability [1,2]. In the development of $BiVO_4$ photoanodes, we have developed a number of approaches including reactive sputtering, chemical vapor deposition, and hydrothermal synthesis to produce both thin film and nanostructured photoanodes. These allow us considerable control over the Bi/V stoichiometry, doping, contact design, and catalyst integration, all of which will be shown to influence the performance of $BiVO_4$ as a photoanode. [3,4].

Initial work regarding the energy payback times for prospective integrated solar water splitting approaches will also be discussed [5].

1. M.-H. Lee *et al.*, *Angewandte Chemie International Edition* **51**, 10760 (2012).
2. Y. Lin *et al.*, *Nano Lett.* **13**, 5615 (2013).
3. .L. Chen *et al.*, *J. Phys. Chem. C* **117**, 21635 (2013).
4. E. Alarcon-Llado *et al.*, *Phys. Chem. Chem. Phys.* **16**, 1651 (2013).
5. P. Zhai et al., *Energy Environ. Sci.* **6**, 2380 (2013).

Solar Quest Host: Prof. K. Fujii, Prof. Y. Okada
Refreshments will be served.

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