Christian Doppler Symposium on Solar Fuels

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The Christian Doppler Symposium on Solar Fuels has taken place on 18 September 2015 at St. John's College in University of Cambridge. Twelve scientists in artificial photosynthesis have been invited to discuss the challenges of and possible pathways to a working solar fuels device this time. The one-day symposium included four sessions: CO_2 transformation, biological systems, materials and devices, and spectroscopy.

The first talk was given by Prof. Osamu Ishitani who reported photocatalytic reduction of a low concentration of CO_2 which was of significance because CO_2 was mostly emitted at a low concentration, e.g. 5% – 10% from thermal power plants. Dr. Moritz F. Kuehnel presented his recent work on photocatalytic formic acid decomposition on CdS nanocrystals with controllable selectivity for H_2 or CO. Prof. Judy Hirst talked about reversible interconversion of CO_2 and formate by Tungsten- and Molybdenum-containing formate dehydrogenases, and demonstrated EcFDH-H as an attractive model system for mechanistic investigations.

After morning tea break, Prof. Gary Brudvig from Yale University unveiled his findings on the structure and oxygen isotope effect of Photosystem II. Dr. Andrea Sartorel reported the development of transition metal based molecular catalysts using polyoxometalate ligands, which could be activated by visible light with high quantum efficiencies. Dr. Nicolas Plumeré then showed their redox hydrogels for bio-fuel cells and bio-photovoltaics in order to lift the limitation the insufficient stabilities of the nature's catalysts.

In the afternoon Prof. Daniel Nocera talked about the device development to convert carbon dioxide, along with the hydrogen produced from the artificial leaf, into biomass and fusel alcohols. Dr. Paolo Bombelli presented his interesting work on bio- and photo-bio electrochemical systems, which directly produced electricity from the oxidation of organic materials or conversion of solar energy. Prof. Roel van de Krol gave an impressive presentation about the challenges and opportunities using metal-oxide absorbers for solar water splitting. His recent work suggested that surface recombination might be a key issue to reach high solar-to-hydrogen efficiency.

In the final session, Prof. Leif Hammarström presented his recent work on resolving the molecular catalyst mechanisms and intermediates of artificial photosynthesis. Dr. Libby Gibson talked about the recent findings using dye-sensitized NiO cathodes for the photo-reduction of carbon dioxide or water to solar fuels. At last, Prof. Devens Gust discussed several examples of mimicry of photosynthetic photoprotection and photoregulation to avoid the formation of reactive oxygen species and other deleterious substances in artificial photosynthesis.

The symposium was very informative and the quality of talks was excellent. During the break time I enjoyed the useful discussion with colleagues for in-depth ideas exchange.

I would like to say thanks for all the organisers from Dr. Erwin Reisner's group who brought us all these wonderful talks and the support from UK Solar fuels Network.