Session2

Artificial Photosynthesis（1）

The technological realization of artificial photosynthesis is receiving urgent attention of researchers worldwide. Its realization would make it possible to produce solar fuels such as hydrogen and alcohol from water and carbon dioxide using solar energy. Until now Japan has been leading the world in artificial photosynthesis research, but recently the USA, Europe, China, Korea and other countries have also started to establish centers for artificial photosynthesis and research is intensifying worldwide. For this session we invited Professor Richard J. Cogdell（FRS（Fellow of the British Royal Society））of the University of Glasgow, the leading center of artificial photosynthesis research in Europe, as our main guest. As an esteemed Fellow of the Royal Society, we have asked him to deliver a lecture with a wide perspective on the production of solar fuels by artificial photosynthesis, explaining the current situation and future development of the research centers in Europe and speaking about the ethics involved. For OCU, Professor Yutaka Amao（Professor at the OCU Advanced Research Institute for Natural Science and Technology and Vice-Director of the OCU Research Center for Artificial Photosynthesis）will explain the practice of hydrogen and methanol production using solar energy from a bioengineering point of view. Each presentation will be 1 hour, including time for questions and answers（2 hours in total）.

The Case for Solar Fuels: what we can learn from photosynthesis about how to use solar energy to make fuels

Richard J. Cogdell （Professor, University of Glasgow, UK, FRS.）

Professor Cogdell was elected Fellow of the Royal Society in May 2007. After obtaining his degree and doctorate in Biochemistry at Bristol, he completed his post-doctoral work at Cornell University before becoming a senior fellow in the Department of Biochemistry at the University of Washington in 1974. He returned to the UK in 1975, becoming a lecturer in Biochemistry in the Department of Botany at the University of Glasgow. Here he has made seminal contributions to photosynthesis research - specifically into the structure and function of bacterial reaction centres and light-harvesting complexes - a subject on which he has published widely. He has remained at Glasgow since this return, taking up the Hooker Chair of Botany in 1993. He has also held visiting positions in universities at Gottingen, California, Illinois, Munich and Paris-Sud. He is the president of the International Society for Carotenoid Research and has won numerous prizes, including the Alexander von Humboldt Research Prize in 1996 and the Daiwa Adrian Prize Tokyo in 2001.

As carbon dioxide levels in the atmosphere rise and our climate changes to become more erratic attention is turning to how mankind can provide for their energy needs in ways that minimise the consumption of fossil fuels. Solar energy has the capacity to make a significant contribution to this quest. Currently we have successful solar cells that can produce electricity rather efficiently. However there are problems with just producing electricity from renewable sources such as the sun. Basically we have problems dealing with intermittency and with storage. What is lacking is efficient technologies to use solar energy to make fuels. Fuels represent stored energy that can be accessed on demand. There is, however, one major chemical process on Earth that can convert solar energy into fuel. This process is photosynthesis. My lecture will describe how we can potentially use our deep understanding of this natural process to start to devise artificial ways to mimic photosynthesis in order produce solar fuels.

Artificial Photosynthesis based on the Bioengineering Technology for Solar Fuel Production

Yutaka Amao （Professor, Osaka City University Advanced Research Institute for National Science and Technology）

Professor of the OCU Advanced Research Institute for Natural Science and Technology, Osaka City University/ PRESTO Researcher, JST【Academic Degree】Doctor of Engineering（Tokyo Institute of Technology 1997.3）【Research Interest】Biocatalysis Chemistry, Photofunctional Material Chemistry

The major purpose of this presentation is to achieve *"Artificial Photosynthesis based on the Bioengineering Technology for Solar Fuel Production"*. In this presentation, production technologies of low-carbon fuels are classified into two categories. The first category is the solar hydrogen production from water based on the artificial photosynthesis using bioinspired system consisting of an electron donor, a photosensitiser, an electron relay and a platinum nano-particle. The second category is the artificial photosynthesis system for solar fuel production from CO_2. This system is a potential technology for photocatalytic CO_2 reduction and synthesis of organic compounds from CO_2 as the starting material.

Chair

Hideki Hashimoto （Professor, Osaka City University Advanced Research Institute for National Science and Technology）

Professor Hashimoto earned a doctorate degree of Science from Kwansei Gakuin University Graduate School of Science. He worked as an assistant professor at Osaka City University's Faculty of Engineering, an associate professor at Shizuoka University's School of Engineering, a visiting associate professor at University of Glasgow. In 2002, he became professor at Osaka City University's Graduate School of Science and he has served as project leader at the OCU Advanced Research Institute for Natural Science and Technology（OCARINA）since 2010. Currently, Prof. Hashimoto is the president of International Carotenoid Society as well as the director of OCU Media Center.