

Title **Electrochemical and Molecular Approaches
for Artificial Photosynthesis**

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Date & Time Wednesday, October 19, 2016 4:00 p.m.
Place I²CNER Hall, Ito campus, Kyushu University

Abstract

The ultimate goal of artificial photosynthesis research is to develop methods to produce carbon-based gaseous and liquid fuels such as hydrocarbons and alcohols from carbon dioxide and water using solar energy as the energy source. In particular for the methods to be commercially viable the overall costs for the production processes should be low enough so that the processes can compete with the current fossil fuel based processes. The fastest and the most commercially feasible approach would be to combine solar cells and electrochemical reduction of CO₂ to carbon-based fuels. For this to be economically feasible the electrochemical reaction should be stable for months, and the electrical energy to chemical energy conversion efficiency (ECCE) should be over high (>60%). Our recent results arising from our efforts to address the above issues will be presented. Another simplest strategy to commercialize artificial photosynthesis is to develop artificial molecular enzymes which can carry out artificial photosynthesis by merely dissolving them into the water pool situated under the sunlight. To make this strategy to be feasible the effective molecular water oxidation catalysts and CO₂ reduction catalysts should be developed and the molecular system consisting of a water oxidation catalyst, a photopump (photosensitizer), and a CO₂ reduction catalyst should be developed. Our recent efforts to address this issue will also be presented.

About the Speaker

Prof. Kyung Byung Yoon received his B.S. from the Department of Chemistry, Seoul National University in 1979. In 1981, he obtained his M.S. from the Department of Chemistry, Korea Advanced Institute of Science and Technology (KAIST), Seoul, where his research field was hydrogenation reactions over metal-doped zeolites. From 1981 to 1984 he was employed by an engineering company, Seoul, Korea. There he gained experience in catalyst design and the engineering of chemical process plants. In 1989, he earned his Ph.D. degree in inorganic chemistry from the Department of Chemistry, University of Houston, Houston, Texas, where his research advisor was Professor Jay K. Kochi and his research field was photo-induced charge transfer reactions in zeolites. From 1989 he has been an Assistant, Associate (1993) and full Professor (1998) to the present. He had served as the President of the Korea Photoscience Society (2011), Councilors for International Zeolite Association (2007-2013) and Asian Photochemistry Association (2007-present), and as Secretary General, Chairman of Scientific Affairs, Chairman of Publications of the Federation of Asian Chemical Societies (FACS) (2005-2013). Since 2009, he has been the Director of the Korea Center for Artificial Photosynthesis (KCAP) supported by the Ministry of Science and Technology. He is also serving as a member of the Editorial Board of Energy and Environmental Science (EES), Section Editor of Current Opinion in Colloid and Interface Science. He is currently Fellow of Royal Society of Chemistry and Global Fellow of American Chemical Society.

Host: Prof. Ken Sakai

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