

Title **Photocatalysis and Artificial Photosynthesis**

Speaker **Dr. Kazuhito HASHIMOTO**  
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Date & Time **Friday, August 10, 2012 4:00 p.m.**

Place **INAMORI Hall, Ito campus, Kyushu University**

### Abstract

Photocatalytic reactions can be classified into two categories. One is the reaction with negative Gibb's free energy change ( $\Delta G$ ), which is studied mainly aiming for environmental purification, and the other is with positive  $\Delta G$ , which is for artificial photosynthesis. In either case, development of multiple electron redox catalyst is one of the most important challenges. For example, multiple oxygen reduction catalyst is necessary for visible light sensitive  $\text{TiO}_2$  photocatalyst. We found that amorphous  $\text{Cu(II)}$  and  $\text{Fe(III)}$  oxides clusters with a size of a few nanometer grafted on semiconductor photocatalysts serve as good two electron  $\text{O}_2$  reduction catalysts, and succeeded in developing efficient  $\text{TiO}_2$ -based visible light photocatalysts. In contrast, 4-electron water oxidation catalyst is indispensable for artificial photosynthesis. One of the candidates of such a oxidation catalyst is  $\text{Mn-oxide}$ , and the development of  $\text{Mn-oxide}$  electrocatalysts for the oxidation of  $\text{H}_2\text{O}$  to  $\text{O}_2$  has long been the subject of intensive researches not only for their importance as components of artificial photosynthetic systems, but also as  $\text{O}_2$ -evolving centers in naturally occurring photosystem II. We found that nitrogen coordination to  $\text{MnO}_2$  drastically decreases in the overpotential for the  $\text{O}_2$  evolution reaction at neutral pH. The present lecture will introduce our recent studies on these two topics.

### About the Speaker

Professor Kazuhito Hashimoto was born in 1955 in Hokkaido, and given education of science at the University of Tokyo. After he received his BS and MS degrees from the University of Tokyo, he obtained a research position at the Institute for Molecular Science (Okazaki, Japan) in 1980. In 1989, he was invited as a lecturer in the Department Applied Chemistry at the University of Tokyo, where he was promoted to an associate professor in 1991. He became a full professor in 1997 at the Research Center of Advanced Science & Technology of the same university. He also assumed the chair of the Department of Applied Chemistry in 2003. He received various awards such as the 2004 Prime Minister Award, the 2006 Imperial Award/ Japan Invention Award and the 2011 Chemical Society Japan Award. He is a honorary Professor at Northeast Normal University in China, and currently serving as a member of Science Council of Japan. His current research interests involve photo-related materials such as photocatalysts, polymer photovoltaic cells and microbial solar cells.

Host **Professor Naotoshi NAKASHIMA**

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