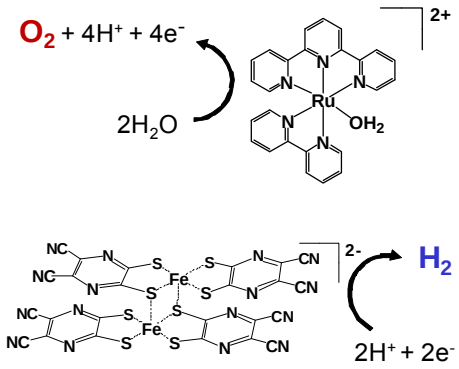
Dr.
Shigeyuki Masaoka

Department of Life and Coordination-Complex Molecular Science,
Institute for Molecular Science
5-1 Higashiyama, Myodaiji, Okazaki,
Aichi 444-8787, Japan
Phone: +81-564-59-5587, Fax: +81-564-55-XXXX
E-mail: masaoka [at] ims.ac.jp

Chemistry of transition metal complexes for solar energy conversion

Visible light-induced water splitting ($2H_2O + 4h\nu \rightarrow 2H_2 + O_2$) has attracted considerable attention in recent years due to its potential application in artificial solar energy conversion and storage. This water-to-fuels conversion consists of the two half-cell reactions; reduction of water to H_2 ($2H^+ + 2e^- \rightarrow H_2$) and oxidation of water to O_2 ($2H_2O \rightarrow O_2 + 4H^+ + 4e^-$). In this context, we have investigated oxygen evolution and photochemical hydrogen evolution from water catalyzed by metal complexes.

In this study, the O_2-evolving activities of new diruthenium catalysts have been evaluated using cerium(IV) ammonium nitrate as an oxidizing reagent. During the detailed studies on these systems, it was also realized that some mononuclear systems are much higher in activity than the diruthenium ones. This finding has become a breakthrough because most of researchers in this field believed that the four-electron process leading to O_2 evolution from water could be much more efficiently accelerated by use of two or more metal centers, as nature uses the tetramanganese one. In this presentation, the O_2-evolving catalysis of these mononuclear ruthenium complexes, together with the mechanism of the O_2-evolving catalysis, will be discussed.



References

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CV

2004	Ph. D., Kyoto University
2004 – 2005	Research Assistant, University of Liverpool
2005 – 2011	Assistant Professor/Research Associate, Kyushu University
2009 – Present	JST PRESTO Researcher "Light energy and chemical conversion"
2011 – Present	Associate Professor, Institute for Molecular Science