



The fifth seminar on Research Center for Artificial Photosynthesis (ReCAP)

The fifth seminar on Research Center for Artificial Photosynthesis (ReCAP) was held on March 29, 2019 with Bio-related Catalysis Division of Catalysis Society of Japan. In this seminar, we focused on X-ray absorption spectroscopy (XAFS) that is useful for the analysis of artificial photosynthesis photocatalysts. We invited two expert lectures.

In the first talk, Dr. Tomohiro Uchiyama, Graduate School of Human and Environmental Studies, Kyoto University, presented “Development of synchrotron radiation Operando measurement technology for electrochemical energy conversion devices”.

Polymer electrolyte Fuel Cells (PEFCs) cathode catalyst requires an excess amount of platinum for oxygen reduction reaction (ORR) at acidic environment. Therefore, it is important to reduce the use of platinum in the catalyst and improve its catalytic activity as well as durability. Core-shell structure is one of the solutions to achieve a higher catalytic activity, higher durability and less use of platinum. However, the factor of controlling ORR activity in core-shell catalyst still has not well understood. Dr. Uchiyama synthesized the 1 mono-layer platinum shell on the carbon-supported palladium (Pt-Pd/C) by potential deposition method and investigated its ORR activity at different temperatures and the chemical state of platinum by rotating disk electrode (RDE) measurements and operando X-ray absorption fine structure (XAFS) respectively. He discussed the effect of oxygen coverage at Pt surface on ORR activity in detailed.



Dr. Tomoki Uchiyama

Next talk was presented by Prof. Maiko Nishibori, Research Institute of Science and Engineering, Kyushu University as the title “Analysis of elements behaviors in steel materials by synchrotron radiation experiments and theoretical calculations”.

Ferritic steel (low carbon steel) in which carbon is dissolved in supersaturation is reluctant to cause remarkable work hardening because redistribution of carbon occurs by aging at room temperature.

Thickness of oxide layer on the surface of low-carbon steel was investigated by X-ray absorption and/or photoelectron spectroscopy. She investigated thickness change of the surface oxide film depending on surface exposure time and the oxidation state which changed by aging treatment time. As a result, it was found that ferric hydroxide and carbon exist in uppermost surface and iron oxide exists in lower layer. In addition, she found that the chemical bonds other than carbon increased with the analysis depth.



Prof. Maiko Nishibori

There were many participants in the seminar, and many questions were raised from the participating teachers and students. At Research Center for Artificial Photosynthesis (ReCAP), we post the latest information on our website and Facebook, including information on this research center and information on tours, workshops and lectures. Please check it out !

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