

The 66th *MANA* Special Seminar



Electrocatalysis - past, present and future

Chair: Prof. Kohei Uosaki (MANA Satellite PI, Hokkaido Univ.)

Dr. Nenad M. Markovic

*Principal Investigator,
Materials Science Division, Argonne National Laboratory*

The successful deployment of advanced energy conversion systems depends critically on our understanding of the fundamental bonding interactions at electrified metal-liquid interfaces. A major contributing factor was the development of an increasingly powerful variety of techniques that provide an in-situ microscopic level characterization of electrochemical interfaces. One class of electrochemical systems of particular significance is electrocatalysis of fuel cell reactions on both single crystal surfaces and the real-world catalysts. The interest in these systems stems from the opportunity to establish the key structure/composition relationships as well as to a deeper understanding of the activity pattern of metal nanoparticles in the size range of few nanometers. Although the field is still in its infancy, a great deal has already been learned and trends are beginning to emerge that give new insight into the relationship between the structure of electrochemical interfaces and catalytic activity/stability of nanoparticles.

Here, past development of electrocatalysis is briefly summarized and then an overview of the field is given by providing a carefully balanced selection of results for the oxygen reduction reaction, the hydrogen oxidation reaction and electrooxidation of small organic molecules first on Pt monometallic and bimetallic single crystal surfaces and then on corresponding real nanoparticles. By focusing on the mechanism of action, we demonstrate that the ability to make a controlled and well-characterized arrangement of surface atoms presages a new era of advances in our knowledge of the electrochemical reactions. Finally, future direction of electrocatalysis is suggested.

Venue: Seminar Room #431, MANA Bldg., Namiki

Date: Mar 17th Tuesday Time: 13:30-14:30

Contact: International Center for Materials Nanoarchitectonics (MANA), Nakata (ex. 8806)