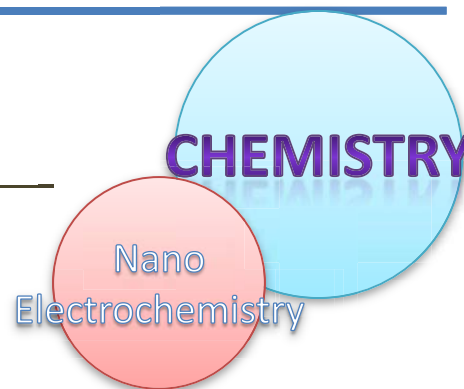


KONDO, Toshihiro

The Natural/Applied Sciences Division / Department of Chemistry

http://www.sci.ocha.ac.jp/chemHP/labos/KondoLab/Index_e.html



■ Researcher information

Contact

Email: kondo.toshihiro@ocha.ac.jp / TEL: 03-5978-5347 / FAX: 03-5978-5347

Major

Physical Chemistry at Interfaces, Nano Electrochemistry, Self-Assembly

■ Research topics

Construction of Ordered Interfaces with Several Functionalities

Keywords

Single Crystal Electrochemistry, Surface X-ray Techniques Using Synchrotron Radiation, Self-Assembled Monolayer, Photoinduced Electron Transfer, Electrode with Functionalities

Contents

■ Overview (background, goal, detail)

In order to strictly understand electrochemical reaction, i.e., reaction with electron transfer at electrode/electrolyte solution interfaces, and to apply it to modern nanotechnology of molecular devices such as artificial photosynthetic system, cells and batteries, and biosensors and gas sensors, ordered interfaces with several functionalities have been constructed with atomic/molecular dimensions and in situ structural studies have been carried out with high spatial and time resolutions.

■ Process, case study

1. Construction of Ordered Interfaces

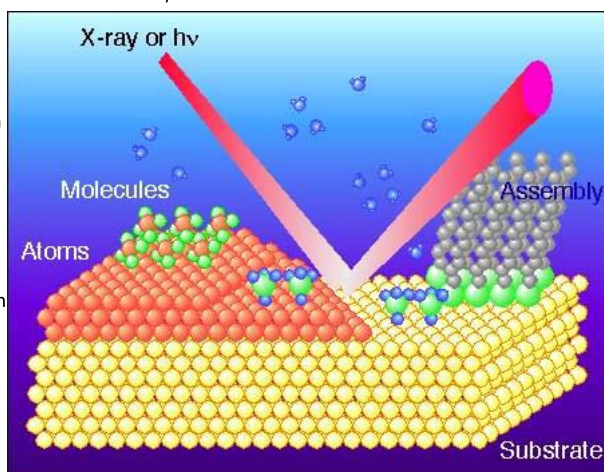
Using self-assembly and single crystal electrochemical techniques, atoms and molecules with several functionalities have been arranged in order on the solid surfaces, i.e., single crystal substrates, molecular devices such as artificial photosynthetic system, fuel cells and/or solar cells, and sensors have been constructed.

2. Development of In situ Structural Analysis Systems

Surface X-ray techniques such as spectrometry and diffraction/scattering methods and also scanning probe microscopy have been applied to electrochemical interfaces, i.e., electrode/electrolyte solution interfaces, three-dimensional interfacial structures have been precisely determined at 0.01 Å order.

■ Potential (applications, future goals)

Chemists have a dream to construct molecular devices with desired functionalities by freely manipulating atoms and/or molecules. In order to achieve that dream, artificial photosynthetic systems have been constructed and cells/batteries with a high performance and sensors with a high sensitivity have been developed. It is expected that these studies become the beginning that solves the modern social troubles such as energy and environmental problems.



Intellectual properties (Patents, computer programs), productization, publications and social/industrial contributions

Photon Factory Seminar of "Application of Surface X-ray Techniques Using Synchrotron Radiation to Electrochemistry" (2008/08/5,6), PF User group representative for solid/liquid interface, Regular manager of nano-interface and surface research informal social gathering in electrochemical society of Japan

Potential of social/industrial contribution

■ Joint research/ licensing / technical consulting / knowledge sharing (open courses, workshops, publications)

In order to apply an appropriate surface X-ray technique with a very high spatial resolution to electrochemistry, high technologies of the design of the electrochemical cell that suits the metrology and the preprocessing of the single crystal electrode, etc, and abundant electrochemistry measurement experiences are required. Joint research/technical consulting to achieve the results with a high impact without spending time is done.