



Topics in Interfacial Electrochemistry and Electrocatalysis

Visiting professor: Gregory Jerkiewicz, (Queen's University, Canada)

Course description:

The mini-course reviews some fundamental concepts of Interfacial Electrochemistry and Electrocatalysis as well as selective topics that are of relevance to the emerging fuel cell technology. The mini-course discusses the electro-adsorption of H (under-potential deposition of H) on single-crystal and polyoriented Pt-group electrodes, and compares the mechanisms of H adsorption under electrochemical and gas-phase conditions. Different adsorption isotherms are presented and discussed. Two experimental methods employed in Interfacial Electrochemistry and Electrocatalysis and capable of examining the surface-chemical composition and interfacial mass variation are presented: electrochemical quartz crystal nanobalance and ultra-high vacuum techniques for electrochemical research. Examples of their application to research on Pt electrochemistry are presented. Particular attention is dedicated to the interfacial behavior of Pt in the potential region of its surface oxide formation. The mini-course ends with a presentation of experimental procedures employed in Interfacial Electrochemistry and Electrocatalysis.

Syllabus of the lecture subjects (enlisted):

Day 1

1. Standard Potentials of HER/HOR and OER/ORR, and the Development of a Pourbaix Diagram for Water
2. Pourbaix diagrams for Pt and Ni
3. Butler-Volmer Equation and Its Analysis in Relation to η , j_0 and b

Day 2

1. Electrochemical Volcano Relationship for HER/HOR
2. General Electrochemical Adsorption Isotherm
3. Hydrogen Under-Potential Deposition
4. Thermodynamics of the Under-Potential Deposition of Hydrogen on Pt(111) and Other Platinum-Group Metals
5. Electrochemical and Gas-Phase Adsorption Isotherms

Day 3

1. Principles of the Electrochemical Quartz-Crystal Nanobalance
2. Calibration of the Electrochemical Quartz-Crystal Nanobalance
3. Applications of the Electrochemical Quartz-Crystal Nanobalance

Day 4

1. Design of Ultra-High Vacuum Instruments for Interfacial Electrochemical Research and Its Application to Study on Pt Surface Oxide Formation
2. Platinum Oxide Growth Under Well-Defined Potential, Time and Temperature Conditions



Day 5

1. Laboratory Procedures in Electrochemistry and Electrocatalysis
2. Determination of the Electrochemically Active Surface Area of Electrode Materials

TERMINY ZAJĘĆ			
Data	Dzień tyg.	Godz.	Sala
13 kwiecień 2015	poniedziałek	9.15-12.00	Luwr (Chemia A)
14 kwiecień 2015	wtorek	9.15-12.00	Luwr (Chemia A)
15 kwiecień 2015	środa	9.15-12.00	Luwr (Chemia A)
16 kwiecień 2015	czwartek	9.15-12.00	Luwr (Chemia A)
17 kwiecień 2015	piątek	9.15-12.00	Luwr (Chemia A)