

Book Review

Electrocatalysis

Edited by Jacek Lipkowski and Philip Ross. Editorial Wiley-VCH. ISBN 0-47124673-5. 376 pages. 115£.

This book is devoted to the exciting new field of heterogeneous electrocatalysis, an area which is strongly related to different aspects of Applied Electrochemistry. It is focused principally on electrocatalysis using well-defined surfaces, such as single crystal electrodes, and its applications to fuel cells. The title could, therefore, be misleading to readers coming from other electrocatalytic fields such as homogeneous electrocatalysis, electrochemical enzymatic catalysis etc.

The book is divided into 8 chapters (that could be grouped into three). The first of them deals with electrocatalysis, from a fundamental point of view, of reactions that take place in fuel cells, chapters 1,2,3,5 and 6. Chapter 4 is devoted to the study of electrocatalytic hydrogenation of organic compounds, and chapters 7 and 8 present a more theoretical approach dealing with outer sphere electrochemical electron transfer and electrochemical ion transfer and double layer structure.

Chapter 1 entitled "Hydrogen adsorption at metal surfaces", by K. Christmann, deals (from a physics point of view) with the mechanism and energetics of hydrogen adsorption on well-defined platinum surfaces in vacuum. The reader should bear in mind here that in Physics the concept of noble metals is not the same as that of Electrochemistry.

Chapter 2 "The science of electrocatalysis on bimetallic surfaces" by P.N. Ross reviews the recent progress in our knowledge of electrocatalysis on bimetallic surfaces with special emphasis on the oxidation reactions of small C1 molecules, methanol and formic acid.

Chapter 3 "Fundamental aspects of vacuum and electrocatalytic reactions of methanol and formic acid" by T.D. Jarvi and S. Stuve, is a long chapter giving a clear and methodical explanation for the anodic oxidation of these two C1 compounds. If it is read after chapter 2 and followed by chapter 6 you get a very good up-to-date account of these two anodic processes.

Chapter 4 entitled "Electrocatalytic hydrogenation of organic compounds" by J.M. Chapuzet, A. Lasia and J. Lessard is divided into two parts; one deals with a general physicochemical presentation of hydrogen evolution reaction and the basis of electrochemical hydrogenation and the second one

describe the electrochemical hydrogenation of different organic compounds from a more organic point of view.

In chapter 5 "Recent advances in the kinetics of oxygen reduction" by R. Adzic, the oxygen reduction mechanism is thoroughly studied in acid and basic medium due to its importance in many aspects of Electrochemistry (fuel cells, corrosion, electrosynthesis etc.). The author gives the latest information about this reaction on different metal electrodes and transition-metal monocyclic complex electrodes (this last point is very briefly treated).

Chapter 6 "Studying electrocatalytic oxidation of small organic molecules with in-situ infrared spectroscopy" by S.G. Sun is focused on the application of surface IR spectroscopy to elucidate the oxidation mechanism of small organic molecules (C1, C2 and C3) on metallic electrodes such as well defined Pt electrodes principally, Au, Ir, Rh, Pd, Cu and Ni. As I said before, this chapter is a very good continuation of chapter 3.

Chapters 7 and 8 have a more theoretical approach. In the first one "A unified model of electron and ion transfer reactions at metal electrodes" thoroughly describes a model of ECET (outer sphere electrochemical electron transfer) and ECIT (electrochemical ion transfer) reactions are presented. The second one "Double layer effects in electrode kinetics of electron and ion transfer reactions" deals with a new formulation of the double layer effects on both reactions, taking into account the three dimensional nature of the problem. As this is a book with special emphasis on electrocatalysis on well defined surfaces, the part dealing with single crystal electrodes is welcome.

To sum up, this is a very interesting, well-written and presented book that will be of great interest to people working on either applied or heterogeneous electrocatalysis. Because it is always very tempting to find something to criticize, this could be the high price of the book and its strong bias towards the fundamental aspects of the electrocatalysis of systems having potential interest for fuel cells. As for very minor errors, there are some repeated references, such as the reference 162 in chapter 6 which is the same as reference 21. Other misprints have been detected but can be easily corrected by readers.

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