Book Section

ADVANCES IN ELECTROCHEMICAL SCIENCE AND ENGINEERING

Vol.2, Edited by H. Gerischer and C.W. Tobias, VCH, Weinheim and New York (1992) ISBN 3-5-2728273-4.

This book is the second volume in the series edited by Gerischer and Tobias. It consists of four chapters - 1. Electrocatalysis of hydrogen evolution: Progress in cathode activation by S. Trasatti, (2) Solid oxide fuel cells by A. Hammou, (3) Second harmonic generation as an in situ probe of single crystal electrode surfaces by G.L. Richmond and (4) Flow modulation techniques in electrochemistry by C. Deslouis and B. Tribollet.

In the first chapter on hydrogen evolution reaction, the author has reviewed the literature of the past 10 to 15 years. After a brief introduction on cathode materials and the related processes, the review is devoted to important general aspects common to all classes of electrode materials and to evaluate the performance of cathodes. These aspects include electrocatalysis, electrocatalytic activity, surface characterization, stability, methods of preparation, electrode poisoning, reaction mechanism and effect of temperature. Some approaches to enhance the electrocatalytic activity of cathodes for hydrogen evolution reaction are discussed. Great part of the review is devoted to all aspects pertaining to specific materials, which include iron, mild steel, nickel, interstitial compounds, sulfides, oxides, alloys, intermetallic compounds and amorphous materials. This review, consisting of about 600 references, is very well presented and critical issues concerning hydrogen evolution reaction are clearly discussed.

Even though technological development of solid oxide fuel cells (SOFC) is rather slow due to high temperature operation, they offer attractive advantages in terms of efficiency and cost. In the second chapter, the author reviews various aspects related to the design of SOFC in addition to the discussion on thermodynamics and kinetics of electrochemical processes. The cell design aspects are illucidated with clear diagrams.

In the third chapter, the progress of surface second harmonic generation as applied to metals in electrochemical environment has been reviewed. General theory for second harmonic generation, experimental results for single crystal electrode surfaces, under potential deposition systems are discussed. As the second harmonic generation has emerged as a novel tool for probing electrode surfaces, this chapter provides useful information for researchers working in this area.

The last chapter is on flow modulation techniques which are another kind of recent interest in electrochemistry both from theoretical and experimental point of view. The authors have presented theoretical considerations at rotating disc electrodes, the advantages of treating the modulation flow problem in terms of impedance, applications of the techniques for measurement of molecular diffusion coefficients, trace analysis, corrosion, electrocrystallization, modified electrodes etc,.

All chapters are presented with illustrative figures, covering exhaustive literature on the topics concerned. The book is certainly a valuable addition to this new series of volumes. It is a source of recent developments as well as present advancements of well known processes in electrochemistry.

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