BOOK SECTION

MODERN ASPECTS OF ELECTROCHEMISTRY

Vol 27 (Ed) R.E.White, J.O.'M. Bockris and B.E.Conway, *Plenum Press, NY* ISBN 0-306-44930-7 (1995) 562 pages

There are seven chapters in this volume written by researchers well-established in their respective areas.

The development in applied and fundamental electrochemical research depends on the kinetics and mechanistic studies of the desired reactions; mass transfer between phases & electrodes; cell design & electrde structures. Digital simulation has proved to be useful in fixing the parameters that lead to high efficiencies. The chapter by Scott addresses these points by setting up reaction models based on electroanalytical techniques and integrating such models in to reactor environments. This area is quite broad and it is well understood why the focus of the chapter is limited to the application of reaction models in synthesis. More importantly, the chapter is a guiding source of information to build models rather than a review article.

The chapter by Despiv and Jovic emphasizes on important and rather difficult area of research - namely, **electrochemical deposition and dissolution of alloys and metal composites**. Though this field is very old (De Ruolz electrodeposited brass and bronze as early as 1842), the complications that are associated with this area have kept the pace of research very high and active. This chapter explains the thermodynamics of alloy deposition in great detail. The effect of adsorption and irregular deposition, anomalous codeposition, induced codeposition and laminar electrodeposition of metals are also explained. The electrochemical characterization of alloy structures concludes the present review.

The third chapter is on the **electrochemical aspects of stress corrosion cracking (SCC)**. The three competing mechanisms that are proposed for SCC (anodic dissolution, clevage and surface mobility) are explained using different examples. The first one has theoretical limitations while the second one is still in the stage of development. The third one is a very recent mechanism that is able to explain most of the observations but still requires more theoretical and experimental development. The experimental techniques available for studying the kinetics of SCC are rather poor.

Fuller and Newman have written the chapter on **metal hydride electrodes**. This area is attracting a lot of attention since this directly deals with energy storage. The industrial production of NiOOH-metal hydride battery is a prime example of the attention that this area is receiving on the commercial front and it is widely expected that this battery will replace the Ni/Cd cell that has the problems of disposal of toxic cadmium. The thermodynamics, electrode kinetics and transport phenomena associated with the metal hydride electrodes are explained. The NiOOH- metal hydride cell is dealt with in greater detail with special emphasis on the optimization of alloys, stability, cell design and self discharge. Fahidy and Gu have reported the recent advances observed in the anodic processes such as oxidation of copper, iron, cobalt, nickel, silicon and some organics. Reduction of metal ions such as Zn(II), In(III), Sn(II), Pb(II), Cu(II) and Cd(II) are also dealt with.

The last chapter by Sandstede and Wurster deals with **water electrolysis and solar hydrogen demonstration project**. Historical description of hydrogen, water

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electrolysis covering Volta's battery pile, the bipolar cell constructed in 1900 and the solar hydrogen energy system developed in Braunschweig in 1964; solar hydrogen economy and all possible water electrolysis processes are presented in detail. Data for technical state-of-the-art of nearly all types of water electrolysis and conventional and advanced electrolyzers are also described. It is clearly pointed out that at the moment, hydrogen from fossil or renewable sources is not competitive with conventional fuels or energy carriers such as coal, oil, natural gas or electricity in terms of price. According to the authors, if the negative environmental effects of the use of conventional energies are taken into consideration, the economic gap might be closed.

Overall, this volume is very well edited and continues to keep up the standard of the series.

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MAINTENANCE FREE BATTERIES (LEAD-ACID, NICKEL/CADMIUM, NICKEL/METAL HYDRIDE) - A HANDBOOK OF BATTERY TECHNOLOGY

II Edition, by D.Berndt, (Series Editor N.E.Bagshaw), *Research Studies Press Ltd., ENGLAND* (1997) 496 pages

One of the most fascinating innovations in the battery technology in recent past is the development and commercialisation of Maintenance Free Batteries for diverse and demanding applications. As we observe from our day to day experience, these batteries do posess inherent disadvantages such as poor cycle life, premature failure etc. This however has not deterred battery experts and scientists from pursuing this technology. Rather more design options, better material etc. are continuously being investigated and evaluated the world over to make these batteries superior, reliable and long lasting. Dramatic changes have taken place in the last ten years to overcome the problems that are affecting their performance and consequently their usage.

In this context, this Hand Book is welcome and will serve as a reference guide for future innovations. It is really an educative experience to go through each page of this book.

This Hand Book is devided into 16 chapters; each chapter is written concisely, precisely and in a lucid language. Three important Maintenance Free Battery systems using aqueous electrolytes (lead-acid, nickel/cadmium, nickel/metal hydride) are covered in depth. Various interesting and important aspects, starting from Thermodynamics to design of Maintenance Free Batteries are discussed. The subject has been developed in such a simple and logical way that even a beginner can grasp it without any difficulty. In addition to the fundamental aspects, case studies are included at appropriate places which would definitely help improving the knowledge and skills of any one involved in battery design and manufacturing. Entire battery research and technologist community in the industry owes a debt of gratitude to the author for updating information on commercially important maintenance free battery systems. This Hand Book is strongly recommended to every one having interest in the development in batteryes.

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