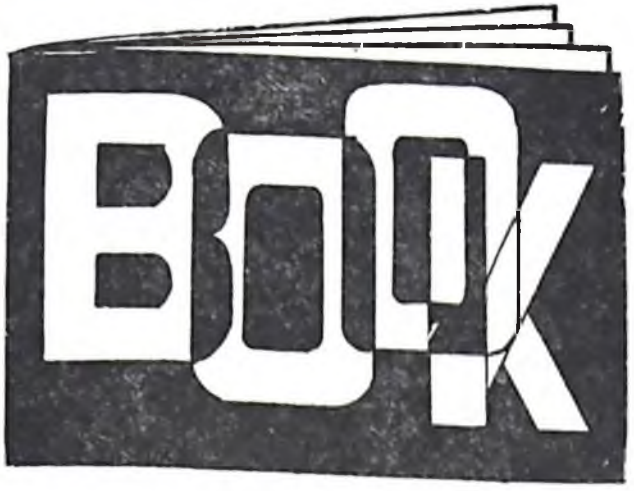


SECTION

BOOK REVIEWS

1. Oxides and Oxide Films (The Anodic Behaviour of Metals and Semiconductor Series) published by Marcel Dekker, Inc., 270 Madison Avenue, New York, N. Y. 10016.

General Information on this Series :

This series treats the anodic behaviour of metals and semiconductors and peripheral areas in an authoritative and interdisciplinary manner. The volumes bring together the fundamental and practical aspects of this field as applied to solid state physics, materials science, electrical engineering, corrosion science, electrochemistry, and related areas.

The initial volumes deal with the physics and chemistry of oxides and oxide films. Each volume will centre on a common theme. Subsequent volumes consider other areas of anodic behaviour such as anodic dissolution, corrosion films, inorganic and organic anodic oxidations, and other problems where oxidative behaviour is of practical importance.

The material in this series will be of great interest to all scientists and researchers in electrochemistry, materials science, solid state physics and chemistry, electrical engineering, metallurgy, corrosion science, semiconductors and electrochemical technology.

The reviews on the first five volumes are presented below.

— EDITOR, JECSI

1.1. **Oxides and Oxide Films** — Vol. 1, 1972, edited by John W. Diggle, 537 pages, S. F. 130.

This is the first volume in the series on Anodic Behaviour of Metals and Semiconductors. The volume contains four chapters on important topics of current scientific and technological interest. Each chapter is an authoritative summary of the topic under discussion.

The first chapter by Brusic is on the general phenomena of passivation and passivity and elucidates the complexities of the processes involved in the active and passive states of metals in general with emphasis on iron in particular. The appendix gives a tabular summary of the range of views on passivity and this is an excellent way of presentation.

In the second chapter, Dignam deals with the mechanism of ionic transport through oxide films. Topics covered include : differential equations for ionic transport in solids, ionic transport across a barrier in the high-field limit, integrated transport equations, ionic transport with control entirely within the film, the role of interfaces in ionic condition through thin films, nature of mobile ionic defects in vitreous metal oxides, mechanism of anodic oxidation of the valve metals, and applications to other metal-film systems. In spite of the large number of mathematical equations, it is indeed a pleasure to see that no serious mistakes have crept in. Although the conclusions reached by Dignam for ion conduction in growing oxides are necessarily not the final in the topic and there is still scope for improvement, it is indeed happy to note that significant progress has been made and further progress can be expected.

Chapter 3 by Mead deals with the electron transport phenomena through dielectric layers. After comprehending all the parameters involved, Mead shows that the phenomena of electron transport can be accounted for in terms of rather simple mechanisms.

In the last chapter, Ahmed reviews and critically examines the information on the electrical double layer at an oxide — electrolyte interface. This area of investigation has been marked by an understandable preference to experiment with bulk oxides and hence the applicability of such work to oxide films on metals has been precisely defined here. The chapter has been well-illustrated with a large number of figures and covers 317 references.

All the reviews are authoritative and up-to-date and the presentation is pleasantly readable. There is no doubt that all the fundamental aspects of passivation, ionic and electronic transports, and electrical double layers are excellently presented in these four chapters.

— J. Balachandra
IISc, Bangalore.

1.2. Oxides and Oxide Films, Volume 2, 1973, edited by John W. Diggle, 402 pages, SF 115.

This is the second volume in the series on oxides and oxide films and deals with four aspects relevant to their character and nature.

In the first chapter Ashok Vijh describes the relationship between anodic oxide solid state structure and electrochemical behaviour. This chapter will be useful to those dealing with corrosion-resistant oxide-coated metals, oxide cathodes in power sources, and electrochemical catalysis on oxides.

The second chapter by Donald Smyth deals with Dielectric-Loss Mechanisms in Amorphous Oxide Films. Practical information with respect to dielectric loss is of great importance in capacitor technology.

This is followed by an important and extensive chapter by Wood, on Porous Anodic Films on Aluminium. The conditions under which pore initiation occurs and the role of the electrolyte in such initiation are discussed. The importance of this understanding on the anodizing of aluminium needs hardly be stressed.

The final chapter by John Diggle examines the phenomena of oxide dissolution. The stability and behaviour of such oxides are discussed with respect to oxide structure, oxide properties and the electrolyte characteristics.

The second volume of this series has been timely and will go a long way in stimulating purposeful fundamental research in these areas.

— Dr. Y. V. R. K. Prasad,
IISc, Bangalore.

1.3. Oxides and Oxide Films, Volume 3, 1976, edited by John W. Diggle and Ashok K. Vijh, 333 pages, SF. 118

The third volume in the series on Anodic Behaviour of Metals and Semiconductors deals with two crucial aspects of oxide film formation. It contains two excellent articles, one on space-charge effects on anodic film formation and the other on chemisorption phenomenon on oxides.

The first is a long chapter by Fromhold devoted to a detailed, computer-generated treatment of space charge effects in growing anodic oxide films. This aids in opening up many avenues for experimental evaluation of such effects, and the reports on the experimental studies with passive iron amply corroborate this point.

Chemisorption of reactants/products upon oxides are of vital importance in virtually all aspects of oxide chemistry, ranging from the oxidation of metals to the catalytic activity of oxides for heterogeneous reactions. Peter Mark and Shih-Chia Chang in the second chapter deal with the dependence of chemisorption on the microscopic properties of zinc oxide, and extend the findings to generalize chemisorption phenomena on oxides.

Both chapters are illustrated profusely and will be most useful to all those engaged in researches of this type.

— Dr. K. Elayaperumal
BARC, Bombay.

1.4. Oxides and Oxide Films, Volume 4, 1974, edited by John W. Diggle and Ashok K. Vijh, 277 pages, SF 110.

This fourth volume of the series on Anodic Behaviour of Metals and Semiconductors is an

impressive one from the point of view of the topics covered and the quality of the chapters written by experts in the field.

The first chapter on Diffusion and Defects in Oxides by Seltzer discusses the diffusion of ions under chemical potential gradients ; experimental and theoretical discussions are excellently presented, and both intraphase and interphase diffusion finds a place there.

The second chapter by Guryn deals with the radiation effects in the insulator region of metal-oxide-semiconductor (MOS) devices ; the practical benefits accruing from such oxides are also discussed. It should have enlarged its scope to include all important MOS devices other than SiO_2 alone which has received all the emphasis in the Chapter.

One of the metals of great abudance and utility is aluminium and the successful method of extraction of aluminium is the Bayer Process of purification of alumina ; other methods are also being worked out. From this point of view the final chapter on the Aluminium-water system by Alwitt is very important. It delineates the reactions of aluminium with water in respect to hydration, dehydration and ageing reactions of the formed oxide film. It is well known that the leaching rate of Al_2O_3 is strongly dependent upon the degree of hydroxylation of the alumina surface. This Chapter is therefore of great interest to hydrometallurgists.

As with the previous volumes, there has been the right choice of experts in dealing with the topics covered and each of the chapters is excellently presented.

— Dr. G. Prem Kumar
Hind. Zinc Ltd.

1.5. Oxides and Oxide Films, Volume 5, 1977, edited by Ashok K. Vijh, 184 pages, SF 84.

The fifth volume of the series on Anodic Behaviour of Metals and Semiconductors contains only two chapters, one on Anodic Oxides on Noble Metals by Belanger and Vijh, and the other on Gas Discharge Anodization by Hanlon. Each chapter deals with the formation and properties of anodic oxides, the first on the formation of anodic oxides in liquid electrolytes and the other by some form of oxygen discharge in the gas phase.

Anodic oxide film growth on noble metals and their alloys has intrinsic fundamental importance and has possible applications in devices in which good electrocatalytic surfaces are essential.

The oxides formed by gas discharge anodization also find diverse applications in capacitors, josephson junctions, Xerography, planar transistors etc. From this point of view, the second chapter is of topical interest.

This volume has been rather small in size and the cost of the volume has consequently been on the higher side. However, the reviewer feels that the book is certainly the money's worth. Both the chapters present many useful data and information, and open up many avenues for further investigation.

— Dr. R. Chandrashekar
FCI, Gorakhpur

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2. Modern Aspects of Electrochemistry, Vol. 12, 1977, edited by J.O'm. Bockris and B. E. Conway, published by Plenum Publishing Corporation, 227 West, 17th Street, New York 10011, 325 pages, $ 32.50.

Presented in this volume of an important and distinguished series are timely and comprehensive reviews on recent developments at the forefront of contemporary research in Electrochemistry. A large amount of information on the theoretical and experimental developments is given in a concise and precise form, and electrochemists and allied scientists will find it extremely useful in their pursuits. The Bockris-Convey editorial touch is seen in all the chapters.

The first chapter on Proton Transfer in Solution is by T. Erdey-Gruz and S. Lengyel. The authors discuss the ideas concerning non-Stokesian mechanisms of ion transport. After presenting the experimental findings, the authors discuss the relevant theories and make some critical conclusions.

The second chapter by Covington and Newman deals with NMR Studies of the Structure of Electrolyte Solutions. This solution-oriented article concerns

with the use of NMR in the analysis of solution constituents.

The role of the double layer at the electrode-solution interface has been a subject of many experimental and theoretical investigation. The third chapter by Habib on Solvent Dipoles at the Electrode-Solution Interface deals with this aspect in depth. The section on the influence of metal on the solvent properties is a beautiful one.

The energy crisis has initiated many investigations in fuel cells and electrocatalysis. Kinoshita and Stonehart discuss the progress in this area in their Chapter on Preparation and Characterization of Highly Dispersed Electrocatalytic Materials.

The last chapter by Farges and Gutmann on Charge-Transfer Complexes in Electrochemistry presents an excellent review of this area. The section dealing with Biological applications is an important contribution in this field. Perhaps, biochemists and organic chemists will find this most useful to them. This volume is a most delightful presentation of reviews on current areas of research in theoretically and industrially important areas of research. Well done, editors, authors and publishers.

— Prof. K. I. Vasu,
IISc. Bangalore.

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