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NEWS

Book reviews

Electroanalytical stripping methods
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Volume 126 *in* 'Chemical analysis: a series of monographs on analytical chemistry and its applications', (J. D. Winefordner, series editor)
John Wiley & Sons, New York (1993) ISBN 0-471-59506-3

Stripping voltammetry and potentiometry represent some of the most sensitive techniques available to the analytical chemist and are an important application of electrochemistry to the modern world. These techniques employ a preconcentration step during which the analyte is deposited onto/into the working electrode of an electrochemical cell. The analytical determination is based on the electrochemistry of this accumulated analyte, which usually, although not always, results in stripping of the analyte back into solution. 'Electroanalytical stripping methods' presents an account of how these techniques can be employed for measurement of analyte concentration and other properties of materials. It contains six chapters: discharge–ionization of metals; the choice and formation of analytical signals; electrodes and electrolysers; stripping electroanalytical methods in the analysis of solutions; phase analysis of solids; and an investigation of the specific features of the structure of a solid.

The first chapter presents the deposition and stripping of metals onto/from solid electrodes. This deals with the crystallization process and the influence of additional metal species on deposition kinetics and thermodynamics and the presence of different metal energy states on the surface. These aspects of stripping analysis are not available in other texts of this type and so are a very welcome discussion.

The second chapter deals with the types of analytical techniques employed for evaluation of deposited materials: stripping voltammetry, potentiometric stripping, the influence of adatoms and 'third element' effects are presented. The chapter on electrodes and electrolysers discusses the various types of electrodes and materials available for stripping analysis (e.g., metal, carbon and modified electrodes) and designs of cells for stripping measurements. Chapter four presents mainly applications to the analysis of solutions and includes many tables of applications (e.g., analysis of environmental and biological materials, impurity determinations in coatings and crystals).

The final two chapters are on the topic of voltammetric characterization of solid materials after incorporation of the solid into the matrix of a carbon paste electrode, giving the carbon paste electroactive electrode. This approach has been applied to the phase analysis of materials (e.g., alloys, chalcogenides, oxides and to investigations of the specific structures of solids such as electrochemical responses due to disorder in a solid).

Overall, the text is quite informative and well referenced. It provides a timely review of the literature of stripping analysis and so would be a useful addition to the library of the electroanalytical chemist. Throughout there is an emphasis on practical aspects of stripping methods. Those interested in the characterization of solids should also find topics of interest here. Although the book covers material available in reviews and other texts, it also presents many new aspects of stripping analysis not readily available in other sources. There are 546 references, quite a number of which relate to papers from the former USSR. Thus the book opens up a wealth of information not readily available to the western reader. A major criticism, however, is its readability; the publisher might have done a better job on editing the text.

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Integrated chemical systems: a chemical approach to nanotechnology by Allen J. Bard, 342 pp, Wiley Interscience, Chichester, UK (1994)
£41.50, 0-471-00733-1

This book, written over the period from 1987 to 1992, is based on the Baker lectures, given by the author in the Spring of 1987 at Cornell University. Starting with a useful list of abbreviations, which includes the structures of selected compounds, the book consists of seven chapters entitled: (1) 'An introduction to integrated chemical systems', (2) 'Construction of integrated chemical systems', (3) 'Characterisation of integrated chemical systems', (4) 'Chemically modified electrodes', (5) 'Electrochemical characterization of modified electrodes', (6) 'Photoelectrochemistry and semiconductor materials', (7) 'Future integrated chemical systems'. Each chapter ends with a list of references, many of which are based on the author's own publications (this choice, as explained and apologized for in the preface, was driven by ease of access to literature).

Integrated chemical systems (ICS) are defined as 'heterogeneous, multiphase systems involving several

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different components (e.g., semiconductors, polymers, catalysts, membranes) designed and arranged for specific functions or to carry out specific reactions or processes'. The discussion is restricted to systems with structural elements ranging from the scale of molecular dimensions to a few micrometers. The book often makes a parallel between natural and man-made systems. Natural integrated chemical systems (biological systems), for example, mitochondrion and chloroplast, achieve a very high degree of integration, have the ability to self repair and reproduce and are highly efficient. Man-made integrated chemical systems are found in heterogeneous catalysts, photoelectrochemical systems and microsensors; they are far less advanced than their natural equivalents and the aim of the text is to draw from recent research projects to discuss many concepts which will allow the fabrication of devices with greater chemical specificity, better integration and higher efficiency. The author illustrates the development, construction and characterization of such systems with references and examples taken from the semiconductor industry and integrated circuit technology. The solid/liquid interface features prominently in the text and electrochemistry plays an important role in the construction techniques and in the characterization methods. Electrochemists will find many familiar examples, techniques and concepts. Readers will also recognize, in particular within Chapters 4, 5 and 6, the style (and some of the diagrams) of the well known textbook by Bard and Faulkner. In the present monograph the level of complexity is kept to a minimum; this is in part achieved by the use of numerous schematic diagrams and experimental figures.

This contribution is very timely (the author admits that one of the reasons for taking so long to complete the draft was the desire to include some of the most recent and exciting developments) and, as the subtitle indicates, it offers a chemical perspective to the concept of nanotechnology. I suspect, though, that researchers in the fields of bioelectrochemistry, semiconductor electrochemistry and photoelectrochemistry will find that the discussion does not go far enough and that the ideas have been around the community for some time. Nevertheless, it was clearly the intention of the author to reach a wide scientific readership. To this end he is well on the route to success. Certainly the book is recommended to the scientific community and to PhD students in particular.

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