

Book reviews

Batteries for Electric Vehicles

D. A. J. Rand, R. Woods and R. M. Dell (Research Studies Press, Taunton, UK; Wiley, New York, 1998), ISBN 0 471 96799 8; 577 pp; £60 (hardback).

Few people will realise that battery-powered electric vehicles first became commercially available in the 1890s. In the last 40 years, interest in electric vehicles has been renewed whenever oil crises loom. However, current interest is largely driven by global concerns for the environment and the understanding that vehicles powered solely by internal combustion and diesel engines must have a limited lifetime due to the inherent pollution problems they cause. The search for alternative/hybrid power sources has resulted in most vehicle manufacturers taking a close look at competitive batteries and fuel cells for vehicle propulsion.

Although there is an extensive literature on electrochemical power sources for automotive applications, much of it is dated, over-specialized or difficult to digest. This contribution is welcomed as a readable account of modern batteries for electric vehicles; the authors have taken care to ensure that the material is treated in a balanced and digestible fashion, even for the nonelectrochemist.

The work provides an overview of the progress made in the development of rechargeable traction batteries together with a brief resumé of fuel cells. A particular feature is a discussion of the many battery types which have been constructed, aided by well-selected photographs in Chapter 1. Chapter 2 treats

the fundamentals of energy storage, Chapter 3 outlines performance criteria and testing schedules and Chapter 4 provides a detailed treatment of laboratory testing. The major part (Chapters 5–9) provides an account of the advances made in lead/acid-, alkaline-, redox flow-, sodium- and lithium-batteries. The consideration of strengths and weaknesses, brief historical perspectives and industrial developments are strong features. The final chapter takes a broad look at the future development of batteries for electric vehicles and notes that political, environmental and commercial factors will complicate any conclusions made from a simple technical comparison.

The authors (each of whom have many years experience of conducting research into batteries) deserve congratulations for providing such a readable and comprehensive treatment of batteries for electric vehicles. The book should prove useful to a wide range of academic and industrial workers, including automotive design engineers, fuel lecturers, environmental scientists and electrochemists. It is recommended reading for all electrochemists; I have already used some of the material in lectures to environmental and chemistry courses at undergraduate level.

The front cover shows a sports coupé powered by 'solar/electric energy'; we look forward to such developments – as long as the 0–60 mph acceleration time is not decreased too much!

F. Walsh
University of Portsmouth, UK

Environmental electrochemistry: fundamentals and applications in pollution abatement

Krishnan Rajeshwar and Jorge Ibanez (Academic Press, San Diego, 1997), ISBN 0 12 576260 7/760 pp.

Electrochemistry is now established as a method by which many pollution and environmental problems in industry are solved. This book will help to reinforce this position by bringing together much of the science and technology associated with its application. It is a good source of material on electrochemistry and photochemistry relevant to pollution abatement in a wide range of industrial sectors, with the exception of the nuclear industry, of which the authors profess to have little experience and thus have preferred not to write about. I am sure this absence will disappoint several readers and environmentalists. Otherwise, the text is comprehensive in its coverage of the subject area, including both fundamental aspects and applications. It contains an abundance of references and, importantly, a listing of

companies marketing appropriate technologies and devices for pollution abatement and sensors. This compliments the eighth chapter which focuses on technology and industrial applications of electrochemical pollution abatement.

On an initial inspection readers may be a little lost as the chapters do not carry headings. This is my summary of the material covered: Chapter 1: A general introduction to pollution abatement (56 pp, 72 references); Chapter 2: Fundamentals of electrochemistry and electrochemical cells (68 pp, 15 references); Chapter 3: Electrochemistry of organic, inorganic and organometallic pollutants (72 pp, 123 references); Chapter 4: Electrochemical sensors (148 pp, 575 references); Chapter 5: Electrochemical treatment of pollutants (136 pp, 383 references); Chapter 6: Photo assisted treatment processes (124 pp, 332 references); Chapter 7: Water disinfection processes (60 pp, 187 references); and Chapter 8: Commercial applications of electrochemical and photochemical processes (50 pp, 54 references).

The book will be useful to practicing electrochemists and environmentalists considering electrochemistry as a solution to pollution, waste and water treatment problems. The level of the electrochemical science is of a suitable depth to support the description of the applications. The book has the attraction

of providing a quick snapshot of electrochemical solutions to specific pollution problems and is recommended.

K. Scott
Newcastle University, UK

Corrosion Inhibitors. Principles and Applications

V. S. Sastri (Wiley, 1998; 903 pages; ISBN 0-471-97608; price £160)

As my research students know only too well, there are thousands of scientific papers on corrosion inhibitors scattered around the literature – but relatively few concerted treatments in the form of reviews and books. Hence this text is welcome as an attempt to bring together the principles and practise of modern corrosion inhibitors.

The 18 chapter text has several strong points. It provides an extensive coverage of diverse inhibitors for ferrous, copper, aluminium and other metals and considers fundamental techniques (electrochemical and surface science) for the characterisation of inhibitor action and efficiency. Both near-neutral and acid environments are considered and there is an emphasis on practical, commercially important compounds. The wide coverage in the book is illustrated by the treatment of topics as diverse as hard and soft acids and bases, expert systems, electrochemical impedance spectroscopy and discounted cash flow economics.

It is, perhaps, inevitable that some analytical techniques will be missing. I would have preferred X-ray absorption spectroscopy to feature as a powerful technique capable of providing local coordination information on metal-adsorbate bonding.

While microbial corrosion is considered, the treatment of biocides and bactericides is slight. Phosphonium species, for the inhibition of ferrous metals in acidic environments, did not receive a mention and some of the photographs of electrochemical instrumentation have not reproduced well. These are minor comments; the strength of this book lies in its extensive coverage of a continuously developing subject within the confines of a large text book. The author has made a bold attempt to cover all aspects of corrosion inhibitors from their fundamental structure and electrochemistry through to the economics of their application. A final chapter on environmentally safe inhibitors serves as a reminder that many industrial organisations have increasingly focused on the synthesis of such compounds over the last decade.

This book should provide the single best source of information on corrosion inhibitors for both development chemists and engineers in industry and for R D workers in universities and research institutes. Due to its extensive coverage, it deserves to be read by the majority of scientists in corrosion and associated electrochemical fields. I currently have two post-graduates working on corrosion inhibitors who have welcomed the text; it has disappeared into the research laboratory for dissemination.

Frank Walsh
University of Portsmouth, UK