J Solid State Electrochem (2012) 16:2845–2846
DOI 10.1007/s10008-012-1695-6

BOOK REVIEW

Handbook of battery materials, Daniel C, Besenhard†, J.O., eds, 2nd ed., 2011, XXXIV + 989 p., 285 £; ISBN: 978-3-527-32695-2

Rudolf Holze

Received: 13 February 2012 / Accepted: 14 February 2012 / Published online: 3 March 2012

(Almost) Everything about batteries is materials science. This statement, which looks slightly outrageous from the traditional electrochemists point of view and which looks very appropriate from many materials scientists point of view, seems to have various authors. J.O. Besenhard, who prepared the first edition, seems to be among them. Definitely even before the advent of primary and secondary lithium batteries, knowledge of the preparation and behaviour of materials was helpful or even quintessential in improving the performance of the many electrochemical energy conversion and storage systems around us for many decades already. As pointed out in a companion review of a similar book by R.A. Huggins,[1] mayor progress in almost all aspects of new systems as well as with already established systems still in need of improvement will most likely result from modified or entirely new materials prepared by a variety of methods much broader than we tend to envision today.

Scientists dealing with these materials in universities, research institutions and in industry will consequently have to keep abreast of scientific development consulting journals, conference proceedings and similar resources. Books covering rapidly developing fields tend to have a very short lifetime because many new results obtained already during preparation of the book will make many details carefully assembled obsolete already on the day of publication. Obviously the speed of progress in this area varies wildly from system to system. There are some real hot candidates like lithium-ion batteries or systems employing solid electrolytes, whereas in some other fields (irrespective of commercial or technical importance) a steady but slow pace can be observed.

Accordingly the preparation of any book on the subject of materials for batteries is a risky enterprise, and in case of a single author book where everything needs to be done by just one person, the risk seems to be higher for the reasons outlined. Nevertheless such books are necessary in general, and with regard to the subject treated here, the need is even more urgent because many newcomers with neither a background in chemistry nor in materials science are entering the field whether from newly established courses at universities or from traditional non-battery departments in the industry–such book is apparently still looking for an author. To reduce the risk somewhat and to broaden the scope, the editors of the present book have settled for the second option: an edited book. The present author has stressed repeatedly a major inherent weakness of this approach: Interconnectivity between the contributions is not a given, it can be obtained only by meticulous editing. Otherwise significant overlaps and repetitions are as likely as gaps. Substantial differences in the quality of preparation and the actuality are not necessarily another result, but at least they are more likely.

Starting with a brief introduction in thermodynamics and other fundamentals of electrochemical energy storage (actually both storage and conversion, this apparently minor detail seems to be overlooked quite a few times on the following pages) and an overview of practical batteries (whatever this means), the following 26 chapters treat all relevant battery materials and consequently all battery types. Chapters on safety, lifetime, modelling, mechanical aspects and manufacturing complete the exhaustive treatment of the topic. In some cases the more general chapters do not treat all battery

[1] Huggins, Robert A.: Advanced batteries—materials science aspects, 2009, XXX, 474 p., 106.95 €; ISBN: 978-0-387-76423-8

R. Holze (✉)
Chemnitz, Germany
e-mail: Rudolf.holze@chemie.tu-chemnitz.de

systems to the same extent, but this is only a minor drawback because the reader, who's attention has been drawn to a particular aspect when studying the respective chapter, will find most likely relevant information regarding his particular system of interest rather easily.

The chapters have been carefully prepared by authorities in the respective fields, they have been illustrated generously without including too many photographs of already well-known objects of daily use. Many chapters closely resemble reviews with numerous references. This is not bad by itself—the book does not pretend to be a textbook for students. Sometimes it is nevertheless revealing: When, e.g. in a chapter on practical batteries, secondary lithium–polyaniline cells are announced as completely new—with reference to commercial catalogues from 1996—the quoted catalogue is actually listing lithium–vanadium oxide batteries! Certainly a single editor—who continued a work started by J.O. Besenhard—can hardly inspect every single contribution for every detail, but perhaps a word about the actual dates of preparation of chapters may have been helpful. Without this the reader may think that some chapters are just the initial version with only some further reading added at the end, hardly a complete revision and presumably not what Besenhard had in mind when offering a "comprehensive source of detailed information". Fortunately this is only an exception, it is not the rule. Nevertheless the book is a must for any university and research library where research in electrochemical energy conversion and storage is in the focus of research and development.

R. Holze, Chemnitz