duced, and the experimental arrangement is described, as well as the complex chemometric procedures for processing and interpreting the data.

The second part contains detailed descriptions of applications spanning a wide range. It begins with a chapter explaining the arrangement of the topics according to chemical structural units, thus giving the reader easier access to this very broad field. This is followed by chapters dealing with the most important areas of application: polymers and textiles, agricultural products and foodstuffs, industrial process control, and medical diagnostics. The special value of the book arises from the wide variety of applications that are described, including the theoretical fundamentals on which they are based, as well as practical advice about measuring and evaluating NIR spectra.

The continuing growth and variety of industrial applications of NIR spectroscopy has led to instrument manufacturers developing equipment that has become progressively easier to use. However, this trend can mislead users into treating the system as a "black box", with all the well-known dangers of that approach, and the undesirable results that can often be seen. It should be emphasized that the editors of this book have made a special effort towards avoiding those dangers, since they comment: "…it is hoped that this book contributes to a more critical evaluation of near-infrared data, thereby extending its implementation…". In my view the authors of the chapters have achieved that aim.

The well-structured list of contents makes it easy for users to find topics of special interest in the book. I consider that to be a very important strength of the book in view of the varied nature of the contents. The same also applies to the carefully prepared subject index.

The clear structure of the book makes it easy for the reader to form an individual view about the "true" relative importance of different aspects of the subject. Many readers will be surprised to find a long and detailed chapter on NIR-FT-Raman spectroscopy. It appears that the editors have included this chapter for completeness in covering the variety of effects that can be produced by NIR radiation. This impression is reinforced when one looks at the chapter in detail. All the other chapters deal with the overtone bands that are a characteristic feature of NIR spectroscopy: their origin, measurement, and interpretation. To me the chapter on NIR-FT-Raman spectroscopy seems out of place in the book, although that does not diminish the value of the book in any way. After all, NIR-FT-Raman spectroscopy can occasionally be a good alternative to what is generally understood by NIR spectroscopy (and which forms the rest of this book).

Altogether eight authors have collaborated in writing the book. In that way it was possible to ensure that each chapter was written by a specialist and that it is up-to-date in both the science and the applications. That advantage outweighs the small annoyance of inconsistency between different authors in the symbols used (e.g., for dipole moment). Another minor fault is the instances of repetition: for example, the principle of Fourier transformation is first explained in Chapter 3 and then in more detail in Chapter 5 (with no cross-references). However, that has the advantage that the reader can choose between the shorter and the more thorough treatment.

The strength of the book is clearly in its focus on applications. The reader is provided with the necessary theory for the correct use of an NIR spectrometer. The emphasis on applications is given additional support by the inclusion of the basic principles of chemometry. The book is recommended for every laboratory in which NIR spectroscopy is used.

Reiner Salzer
Institut für Analytische Chemie
Technische Universität Dresden
(Germany)

Chemical Properties of Material Surfaces. By *Marek Kosmulski*. (Series: Surfactant Science, Vol. 102.) Marcel Dekker, New York 2001. 776 pp., hardcover $ 225.00.—ISBN 0-8347-0560-2

The title of this book, *Chemical Properties of Material Surfaces*, is very general, and one is curious to discover what the topic actually is. The author defines it immediately at the beginning of the introduction: adsorption phenomena at the interface between electrolyte solutions and solid surfaces at room temperature and atmospheric pressure, with a special focus on the correlation between adsorption effects and surface charge. This may seem to be a very narrow specialized topic, but actually it has great importance for many questions in basic research, and numerous applications in mineral processing, soil science, production of ceramics, corrosion protection, and catalysis.

Many studies regarding this topic have been reported in recent decades, and many model descriptions and theories have been developed. To get an overview of this topic or to find suitable data is a big problem for everyone who is interested in this field of research. The author of the present book has set out to summarize the current status of research activities and to give a comprehensive collection of data for different systems. The book is structured in six chapters. A short introduction is followed by a chapter describing the properties and physical parameters of various adsorbents. These crystallographic and thermochemical data are not the main topic of the book, but are an important basis for the contents of the following chapters. Chapters 3 and 4 cover surface charge effects in the absence and presence of strongly adsorbing components. The main topic is a systematic approach to the point of zero charge of surfaces, which is defined in many different ways in the literature. The author provides a comparative discussion of this parameter and of isoelectric points. Over 100 pages of tables with characteristic parameters for different solids provide much useful information for the reader who is interested in details. The adsorbed substances for which data are given are mostly inorganic ions. Only a comparatively short chapter deals with the adsorption of surfactants and polymers. Experimental techniques for determining the quantities adsorbed are also described. Adsorption models and theories are the topic of Chapter 5. A considerable number of recent theories and adsorption equations derived from these theories are presented and applied to the adsorption of ions. The concluding short

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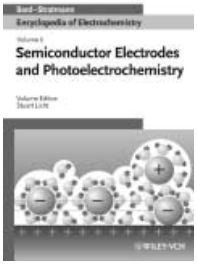
Chapter 6 summarizes the results for adsorption on activated carbons and for latexes as examples of organic adsorbents.

To arrive at a verdict about this book, one must consider who are the readers likely to find it of interest. This is certainly not a book giving a general introduction to the topic or an overview for someone who only occasionally works in this area. But, as a result of its comprehensive and unique collection of theories and data on the adsorption of ions on inorganic solids, it is a valuable resource for everyone who is more deeply involved in the topic, whether from the viewpoint of basic science or that of applications. In addition the long lists of references at the end of each chapter give easy access to the literature for more detailed information.

Wolfgang von Rybinski
Henkel KGaA
Düsseldorf (Germany)

Encyclopedia of Electrochemistry. Vol. 6: Semiconductor Electrodes and Photoelectrochemistry. Edited by *Allen J. Bard, Martin Stratmann* and *Stuart Licht*. Wiley-VCH, Weinheim 2002. 597 pp., hardcover € 349.00.—ISBN 3-527-30398-7

Electron-transfer processes at the interface between a semiconductor and an electrolyte are of fundamental importance for the conversion of light energy into chemical energy. Until the late 1980s the study of such processes was essentially an academic research topic, but more recently the emphasis has shifted to the development of applications. Some examples of applications are self-cleaning surfaces and nanocrystalline solar cells based on titanium dioxide. This book describes the developments in the field, with six chapters that correspond to a roughly historical sequence.



In Chapter 1, K. Rajeswar describes the fundamentals of electrochemical and photoelectrochemical processes of semiconductors. This is a clear and easily readable chapter, but the comparison on page 6 between thermally induced charge transfer and the autoprotolysis of water seems inappropriate, and in Figure 5a the arrow indicating the band gap should end at the edge of the conduction band, not at the Fermi level as shown.

Chapter 2 begins with a contribution by J. J. Kelly, Z. Hens, D. Vanmaekelbergh, and Z. Hensalso, giving a very detailed description of methods for studying the structure of macroporous and nanoporous electrodes and a discussion of the fundamental processes of charge separation and charge transport. The chapter continues with articles on the construction and use of tandem solar cells (by T. Soga), on the "fine tuning" of electrical properties by adsorption of multifunctional organic compounds (R. Cohen, G. Ashkenasy, A. Shanzer, and D. Cahen), and on the characterization of the semiconductor–electrolyte interfacial contact by measuring capacitance and luminescence properties (Y. Nakato).

Chapter 3 is devoted to nanostructured electrodes. It consists of articles on general methods for preparing such electrodes (G. Hodes and Y. Mastai), the preparation and properties of macroporous silica (C. Lévy-Clement), and fullerene-like nanotubes of tungsten disulfide, molybdenum disulfide, boron nitride, and vanadium(v) oxide (R. Tenne).

Chapter 4 is titled "Solar Energy Conversion without Dye Sensitization". The first part, by M. Sharon, begins with a repetition of some fundamentals already covered earlier, but then continues with a description of regenerative photoelectrochemical cells. The following contribution on photoelectrochemical energy storage cells, by S. Licht, makes difficult reading in places because of the many unnecessary acronyms (e.g., in Table 1). The next article on the photoelectrolysis of water in simple and multiple cells (M. Sharon and S. Licht) is easier to read. The chapter ends with a contribution by S. Licht on the optimal design of photoelectrochemical cells; this contains much useful information but is again difficult to read, in this case because there are too many figures which also lack clarity.

Chapter 5, "Dye Sensitized Photoelectrochemistry", begins with a clear account of the historical development of dye-sensitized photoelectrochemical cells and the current state of knowledge (M. Grätzel). It is followed by a very detailed article (by M. K. Nazeeruddin and M. Grätzel) on the properties of the main sensitizers used with titanium dioxide, specifically ruthenium(ii) complexes with polypyridyl ligands, and also certain phthalocyanines. In Figure 2 of this article the ligand-field splitting in the octahedral field is rather inappropriately represented by the symbol ΔOh instead of Δ_O. The third article of this chapter (J. Nelson) is concerned with the mechanism of charge transport in sensitized titanium dioxide cells. The rate-determining step seems to be the diffusion of the electrons, but it has not yet been possible to describe the process quantitatively by a simple model. In the last article of this chapter U. Bach describes cells with a solid electrolyte, including organic polymer cells.

The title of the final chapter, "Non-solar Energy Applications", does not seem quite appropriate. It begins with a detailed and very informative article by A. Fujishima and D. A. Tryk on the mechanism of photocatalysis at a titanium dioxide surface. Unfortunately the literature references from number 30 onward have become rather mixed up, so that only experts in the field will be able to guess at the correct sequence. Also some of the figures (e.g., Fig. 11) are not explained in the text, and consequently do not convey much information. The second article, by T. N. Rao, D. A. Tryk, and A. Fujishima, is easier to read and deals with the many practical aspects of photocatalysis by titanium dioxide. In some places, however, it is difficult to distinguish between processes already in use and those still at the planning stage. Also it would have been useful to include a critical assessment of the present state of progress in the various projects.

To summarize, the book is a fairly well coordinated collection of review articles, which offer not only the specialist but also the beginner a description of the fundamental principles, applications,

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