

Book Reviews

Inelastic Ion-Surface Collisions. Edited by N. H. TOLK, J. C. TULLY (Bell Laboratories, New Jersey), W. HEILAND (Max-Planck-Institut für Plasmaphysik, Garching), and C. W. WHITE (Oak Ridge National Laboratory). Academic Press, New York. 1977. ix + 352 pp. \$21.00.

In the interdisciplinary field of ion-solid interactions, an area currently attracting considerable attention is the interaction of ions with surfaces. This book is a collection of the major presentations given at the International Workshop on Inelastic Ion-Surface Collisions held in 1976 at Bell Laboratories, New Jersey, with an additional contribution on sputtering processes.

One of the major achievements of the book is that it brings together in one place information from a number of disciplines which in the past have been only loosely connected. As a summary of the present understanding of the basic physical processes underlying ionization, neutralization, and excitation phenomena for ions near surfaces, the book is of value to both the novice and the specialist. The contributions are by leading researchers and are clearly presented, with the different contributions well integrated. Throughout the book a clear indication is given of where there is still a need for further experiments or improved theoretical models. For readers who wish to explore individual topics in detail, each chapter has a comprehensive bibliography.

There are also discussions of some exciting new phenomena, including oscillations of the energy dependence of backscattered ion yields, optical polarization effects in collisions at grazing incidence, and wake-riding states. By now much of this material is out of date. However, this detracts little from the overall impact of the book, which should become a basic source for workers in fields ranging from atomic physics to surface physics to materials technology and analysis.

R. B. Alexander, *Wayne State University*

Chemisorption of Gases on Metals. By F. C. TOMPKINS (Imperial College of Science and Technology, London). Academic Press, New York. 1978. xii + 370 pp. £16.80.

"Chemisorption of Gases on Metals" brings together in a concise and lucid style much of the current theoretical and experimental knowledge pertaining to this important aspect of surface science. After a brief summary of state-of-the-art sample preparation and ultrahigh vacuum techniques, the author systematically develops the thermodynamics, statistical mechanics, and quantum mechanics of the adsorption process. In each case, an excellent summary of the topic is followed by a reasonably complete bibliography. Following the theoretical section, the author works into a discussion of current experimental techniques used to characterize surfaces and surface adsorbate layers. Included here are the more conventional experimental tools such as low-energy electron diffraction, ordinary electron spectroscopy, and microscopy plus some of the more isoteric and less widely appreciated techniques such as ion neutralization spectroscopy and appearance potential spectroscopy.

I highly recommend this book as a valuable overview of the topic of chemisorption to both the newcomer and the experienced worker in the field of surface science.

Scott A. Chambers, *George Fox College*

Geochemistry. By ARTHUR H. BROWNLOW (Boston University). Prentice-Hall, Inc., Englewood Cliffs, N.J. 1979. xii + 498 pp. \$19.95.

This text is an attempt to provide an introduction to geochemistry at a level appropriate to advanced undergraduates and beginning graduate students. The nine chapters are entitled: (1) The Elements; (2) Isotope Geology; (3) Thermodynamics; (4) Water Chemistry; (5) Crystal Chemistry; (6) Organic Geochemistry; (7) Sedimentary Rocks; (8) Igneous Rocks; (9) Metamorphic Rocks. At the end of each chapter are questions which could be used as homework problems, and a list of "selected" references. The treatment is sketchy, but the author is consistent in the depth of coverage in each area. The best chapters are those concerned with thermodynamics and water chemistry. The construction of Eh-pH diagrams is presented in sufficient detail to allow students to construct these and other similar and often useful phase diagrams. There are many shortcomings and omissions, however. The introductory discussions are condescending. They are terse

and not sufficiently simplified to be of use to someone with a limited quantitative background, but they are too limited in scope to be useful for reference. In many places the text does not teach, but rather, reads much like a notebook. The graphics are meager and uninspired. All of the diagrams are reproduced from publications; there are no original schematic drawings by the author to illustrate geochemical processes. The isotope geology section is badly out of date, and gives the impression that radiogenic isotopes are used only for dating. There is little mention of the use of trace elements in geochemistry. For example, there is not one rare-earth element abundance diagram, and the only listing of rare-earths in the appendix refers one to the discussion in Chapter 1 on electronic structure. Discussion of meteorites vis-à-vis the earth is minimal. Perhaps the most glaring omission is any indication that the earth has a moon. Although lunar chemistry, or "selenochemistry", might possibly be considered outside the scope of the book, it has provided a view of another planetary body whose life history can be compared and contrasted to that of the earth. I had expected the wealth of knowledge derived from the Apollo missions to play a large part in any modern geochemistry text.

Overall, this book is uninspiring. It lacks a unified approach and fails to identify interesting problems. It is out-of-date. There has existed for at least a decade the need for a complete and up-to-date introductory text for this rapidly developing field. In this reviewer's opinion, this book does not fill the need.

Donald J. DePaolo, *University of California, Los Angeles*

The Porphyrins. Volume II. Structure and Synthesis. Part B. Edited by DAVID DOLPHIN (University of British Columbia). Academic Press, New York. 1978. xix + 437 pp. \$46.50.

The second volume of the seven-volume series on the porphyrins contains ten chapters devoted primarily to compounds obtained by modification of the porphyrin periphery.

Chapter 1 (H. Scheer, 44 pp, 199 refs) and Chapter 2 (H. Scheer and H. Inhoffen, 45 pp, 181 refs) deal with hydroporphyrins (e.g., chlorins, phlorins, bacteriochlorins, etc.). The former chapter discusses the synthesis and stereochemistry while the latter covers the reactions and spectroscopic properties of hydroporphyrins. Oxy- and oxohydroporphyrin derivatives are also mentioned.

The porphyrinogens receive a brief treatment in Chapter 3 (D. Mauzerall, 10 pp, 27 refs) while Chapter 4 (P. Clezy, 27 pp, 90 refs) is devoted to the preparation and spectroscopic properties of oxophlorins (oxyporphyrins). An interesting section on oxidation of hemes and heme catabolism is included. In Chapter 5 (J. Fuhrhop, 28 pp, 101 ref) electrophilic substitution of the porphyrin periphery is discussed, including intramolecular cyclizations, nitration, and halogenation.

Photoexcited porphyrins and metalloporphyrins are considered in Chapter 6 (F. Hopf and D. Whitten, 34 pp, 222 refs). This extensively referenced chapter includes both permanent photochemical transformation of the porphyrin and the porphyrin as a photosensitizer. Chapter 7 (A. Gossauer and J. Engel, 39 pp, 161 refs) contains an excellent treatment of linear polypyrrolic compounds from dipyrromethanes and pyrromethenes to biladienes and bilins. The metal complexes of open-chain tetrapyrrole pigments are treated in Chapter 8 (J. Subramanian and J. Fuhrhop, 32 pp, 71 refs). Chapter 9 (H. Brockmann, 39 pp, 161 refs) considers the absolute configuration of chlorophylls and some tetrapyrrolic compounds. The book is concluded with a discussion of nonporphyrin pyrrolic macrocycles such as corroles, corrins, and sapphyrins in Chapter 10 (R. Grigg, 74 pp, 94 refs).

This book contains both author and subject indexes. The literature survey is comprehensive and the most recent references are generally from 1975-1976.

The rapidly expanding field of porphyrin chemistry desperately needed a series of this scope and depth. Dr. Dolphin and the contributors have admirably fulfilled this need. This series will remain the standard reference material for porphyrin chemists for years to come and no one with a serious interest in porphyrins will want to be without this comprehensive and thorough series.

R. C. Haushalter, *University of Michigan*