

Book Reviews*

Nitrosamines. Toxicology and Microbiology. Edited by M. J. Hill (PHLS Centre for Applied Microbiology). VCH: New York and Weinheim. 1988. 169 pp. \$125.00. ISBN 0-89573-605-0.

The carcinogenic character of many nitrosamines, especially dimethylnitrosamine, has become well known, and world-wide attention has been focused on how nitrosamines can arise in food. This little book reviews the subject, with chapters on analysis for nitrosamines, endogenous and exogenous formation, toxicology, carcinogenesis, and potential risk and its reduction. Some general information on the sources of nitrosamines, and on their chemistry, is given, but the strength of the book is on the biological effects of nitrosamines. It will be disturbing to many to discover how prevalent they are in all sorts of foods, including beer, and how they can be generated in the body from reaction with nitrates. Much quantitative information is given in tables to allow the reader to evaluate the problems. The index is, unfortunately, quite skimpy.

Organic Electronic Spectral Data. Volume XXIV, 1982. Edited by John P. Phillips et al. John Wiley & Sons: New York and Chichester. 1988. xv + 984 pp. \$120.00. ISBN 0-471-61511-0.

This volume consists of an enormous table, as usual in the series, listing compounds in formula-index order and giving name, solvent, absorption maxima, absorptivities, and references. In spite of its impressive size, this volume reports only data published in 1982. It is appropriate that the editors have dedicated this volume to the late Mortimer J. Kamlet, one of the co-founders of the series.

Balancing the Needs of Water Use. By James W. Moore. Springer-Verlag: New York and Berlin. 1989. xi + 267 pp. \$69.00. ISBN 0-387-96709-5.

This latest volume from J. W. Moore provides an extensive overview of the varied uses of water in society, with emphasis on constraints on and consequences of these uses. Contrary to the title, however, the book deals not so much with the *balancing* of these uses as a presentation of the issues peculiar to each type of use that will need to be considered in future balancing deliberations. In this latter context the book does an admirable job of covering the waterfront, if you will. There is, in particular, a worthy attempt to integrate scientific considerations in water-quality issues with public perceptions of these issues. After all, a "problem" may be defined by a human perception and value judgement of an objective situation.

Topics covered in the volume include a basis in hydrology as it applies to human uses of water, a review of specific water uses, and extensive discussion of water quality and supply as affected by these uses. The book concludes with an all-too-short section on some considerations in balancing. Writing in the book is generally acceptable, though marred by a number of ambiguities, omissions, and value judgements. Readers of this journal will find this book useful primarily as a guide to water-quality issues being worried about these days; this guide may serve to help direct research and education to the extent that chemists participate in the solutions to these issues. The topic is of course an increasingly topical one, with pressure on freshwater supply and quality likely to become one of the major economic and environmental issues of the next century.

Lawrence M. Mayer, *University of Maine*

Advances In Oxygenated Processes. Volume 1. Edited by Alfons L. Baumstark (Georgia State University). JAI: London and Greenwich. 1988. xii + 209 pp. Institute, \$68.50. Individual, \$34.25. ISBN 0-89232-866-5.

This volume was produced under the overall editorship of Albert Padwa, who is editing several series of volumes for JAI Press on modern organic chemistry. This particular series covers the chemistry of oxygen and oxidation processes, and is being edited by A. L. Baumstark. The editors promise that the series will cover all aspects of organic oxygenation processes, including oxygen chemistry, singlet oxygen, ozone, oxy radical chemistry, oxygen atom transfers, organic peroxides, and chemiluminescence and bioluminescence, a broad assignment indeed. These volumes also promise to cover the role of oxygen radicals in biochemistry. However, this volume deals primarily with the organic chemistry of oxidation processes, a field that, in this reviewer's opinion, can use a series of reviews devoted solely to it. (Free-radical biology, in contrast, already has two journals devoted exclusively to it.)

The present volume has just five chapters, each rather long and detailed. The chapters cover catalytic functionalization of hydrocarbons by C. L. Hill, thermolysis of 1,2-dioxetanes by A. L. Baumstark, singlet oxygen reactions with 1,3-butadienes by E. L. Clennan, luminescent beetles by E. J. H. Bechara, and α -azohydroperoxides by D. W. Dixon.

This book is well produced, with careful attention to the typesetting of difficult organic structures. It will certainly find use with organic chemists interested in the application of oxidation processes to organic synthesis. Unfortunately, the book has no author or subject index, a deficiency that it would be useful to correct in future volumes.

W. A. Pryor, *Louisiana State University*

Angular Momentum. Understanding Spatial Aspects in Chemistry and Physics. By Richard N. Zare (Stanford University). Wiley: New York and Chichester. 1988. xi + 349 pp. \$39.95. ISBN 0-471-85892-7.

This book gives an excellent presentation of angular momentum theory, and its applications to numerous interesting problems in modern chemistry and physics.

Even though basic knowledge of quantum mechanics is required, the text starts from the beginning, and the presentation is clear and easy to follow. One reason I enjoyed going through this text was the interesting and instructive examples and applications appended to each chapter.

The book is probably best suited for a one-semester graduate-level course, but it could also be used for self-studies and for reference.

Svein Saebø, *Mississippi State University*

TrAC Reference Edition. Volume 6: 1987. Volume 7: 1988. Volume 6: Elsevier: Amsterdam and New York. 1988. viii + 282 pp. \$160.50. ISBN 0-444-42941-7. Volume 7: Elsevier: Amsterdam and New York. 1989. 416 pp. \$200.00. ISBN 0-444-87323-6.

These two volumes are hard-bound collections of the "archival material" originally published in the periodical of the same name. The pagination is continuous, and there are author and subject indexes.

Aromatic High-Strength Fibers. By H. H. Yang (E. I. du Pont de Nemours & Co.). Wiley: New York and Chichester. 1989. xiii + 873 pp. \$125.00. ISBN 0-471-62988-X.

This is a volume in the monograph series of the Society of Plastics Engineers. Its eight chapters consist of an introduction of some length, an overview, and separate treatments of polyamides, and heterocyclic polymers. Each chapter takes up preparation, compositions, characterization, and fiber formation. Extensive tables present masses of data. Although this monograph is aimed toward the applied aspects of the subject, chemistry is abundant, and good structural formulas abound. Much practical detail is described, with information on historical development. The index of less than 4 pages seems inadequate with respect to the size of the book, but this may not be an accurate appearance, because so many of the pages are taken up with tables. References are given at the end of each chapter and number in the hundreds.

Organic Functional Group Preparations. Volume III. Second Edition. By Stanley R. Sandler (Pennwalt Corporation) and Wolf Karo (Polysciences Inc.). Academic: San Diego and New York. 1989. xiv + 552 pp. \$99.00. ISBN 0-12-618603-0.

This new addition shows the evidence to attention to bring it up to date throughout; substantial additions to the references have been made by interpolating them as "a", "b", etc. in the original reference lists. The information in the many tables has also been expanded. In the preface, the authors state that "the literature has been reviewed from 1971 to the present", but since the preface is not dated, the reader has to guess as to what "the present" means (a perusal of the references suggests that it might be 1987).

The format of the first edition is maintained. Each of the 13 chapters is devoted to a specific functional group, ranging from acetate and ketals to thiohydroxamic acids. Each has a short introduction, followed by a review of preparative methods organized by type of reaction (e.g., oxidation, condensation, elimination), and many examples of specific experimental direction are included. Nomenclature is sometimes not well chosen, and is in some cases simply wrong. In the chapter headed Isonitriles, for example, it is stated that this term is used because "it is used in *Chemical Abstracts*". In fact, the CA Index Guide states "Isonitriles—see Isocyanides", and under Isocyanides it is explained that individual compounds are indexed under the name of the parent compound, with "isocyano" as a prefix. The persistent use of names of the

*Unsigned book reviews are by the Book Review Editor.

type of "ethyl isonitrile" is thus unfortunate, for they are not used in CA and are not sanctioned by the more flexible IUPAC rules (ethyl isocyanide and isocynoethane are the systematic names).

A valuable feature of this series is its attention to the patent literature as well as to journals. Another useful feature is the consistent referral to the historical origins of the important preparative reactions; the nineteenth-century literature, which contains many useful nuggets of information, has not been overlooked. The 7-page index is well constructed and helpful.

Critical Stability Constants. Volume 6: Second Supplement. By Robert M. Smith and Arthur E. Martell (Texas A&M University). Plenum: New York and London. 1989. xviii + 643 pp. \$95.00. ISBN 0-306-43104-1.

The scope of this work includes heats, entropies, and free energies of complexation reactions of hydrogen ion and metal ions with organic and inorganic ligands. It is a tabulated assemblage of critically selected values, arranged according to type of ligand: amino acids; analogues of them having heterocyclic nitrogen; amines; azoles; six-membered aromatic heterocyclics containing N (erroneously called "azines"); amino phosphonic acids; carboxylic acids; phosphorus acids; hydroxylic compounds; oxo compounds; thiols; phosphines; ethers; hydroxylamine compounds; amides, etc.

Referencing and indexing are extensive.

Essays in Physical Chemistry. A Sourcebook for Physical Chemistry Teachers. Edited by W. T. Lippincott (University of Arizona). American Chemical Society: Washington, DC. 1988. v + 174 pp. \$39.95. ISBN 0-8412-1478-6.

This sourcebook originated from several seminars and workshops which had the goal to improve the content and effectiveness of undergraduate physical chemistry courses. It contains 10 chapters written by physical chemists, industrial chemists, chemical engineers, polymer chemists, biochemists, and inorganic chemists.

Following an Introduction and Overview of the focus, strategy, and content of the sourcebook by the editor, Lippincott, Chapter 2 by G. A. Crosby on Teaching Physical Chemistry argues that students mostly perceive physical chemistry with confusion and despair, despite its central position in the chemistry curriculum. Crosby has long been a champion of reform and makes several recommendations, including emphasizing physical systems, justifying the content, focusing on the physical meaning of the numerical answers, building mathematical bridges, reinstating demonstrations, designing balanced exams, assigning practical homework, and truncating the number of topics taught.

Chapter 3 is The Coupling of Physical and Chemical Effects. The Most Interesting Things in Chemistry by C. H. Tolman and N. B. Jackson. Here, 20 interesting topics are posed as questions to which solutions and analyses are given in the form of a teacher-student discussion. Some of these topics are Jogging and Heat, The Work of Breathing, Boiling Eggs at 10000 Feet, Homeruns and Humidity, Electric Eels, and Chemical Oscillations and Biorhythms. These topics are practical, fun, thought-provoking, and illustrate that a "physical chemistry and society" approach could be as successful as some of our introductory "chemistry and society" courses. In such courses practical and relevant chemical literacy is taught, something not obtained by most students in the main-sequence courses in which there is time only for stripped-down principles, devoid of applications.

In Chapter 4, Continuity of Species in Physical and Chemical Processes, P. R. Rony argues that a unification of transport phenomena as taught to chemical engineering undergraduates, and physical chemistry as taught to chemists and engineers, is provided by the continuity-of-species equation and its interdisciplinary implications and applications. Rony's approach certainly does constitute curricular reform but seems far more appropriate for graduate rather than undergraduate physical chemistry—at least that normally taken by chemists. In the spirit of Crosby's "less rather than more", Rony's program would have to be considerably winnowed to be the ultimate unification.

H. A. McGee, Jr.'s, Building Enthusiasm for Quantum Mechanics and Statistical Mechanics is an excerpt from his new textbook *Molecular Engineering*. He argues that there is real-world utility in quantum and statistical mechanics—the great hope (but not the usual experience) of every undergraduate. Certainly, the partition function provides all thermodynamic properties, but saying this, as McGee does, and displaying the partition functions for monatomic species, linear, nonlinear, and nonrigid molecules, and then including comparison with experiment, which has been the traditional program anyway, does not necessarily build the desired enthusiasm. McGee's chapter, also, is far more applicable to the graduate course.

The sixth chapter by J. M. Prausnitz, Molecular Thermodynamics of Mixtures, discusses the compromises and synthesis implied by "molecular

thermodynamics"—a combination of thermodynamics, statistical mechanics, molecular physics, and physical chemistry. Prausnitz discusses free volume, potential energy, the extension to mixtures and to large molecules of the generalized van der Waals' partition function, strongly nonideal liquid mixtures, and chemical effects on phase equilibria. This chapter as with the previous two is most appropriate for graduate courses.

L. Mandelkern in Polymer Examples of Thermodynamics, Statistical Mechanics, and Chemical Kinetics argues that polymers have been neglected in chemical education because a vigorous polymer science came after the establishment of the current pattern of chemical education and because polymers are perceived as being too complicated to be comprehended by undergraduates. He then discusses the basic physical chemistry of polymers developed in a way that would not preclude its inclusion in contemporary courses; moreover, it is in the spirit of the goal of the sourcebook.

E. L. King in Applications of Thermodynamics and Kinetics in Inorganic Chemistry shows that many principles of physical chemistry are nicely illustrated by examples from inorganic chemistry. A few of these are as follows: the ever popular ammonia synthesis, the thermal decomposition of water, metal-ion ligation, the kinetics of the reaction of U(IV) with Pu(IV), and the disproportionation of nitrous acid and nitrogen dioxide. Of course, the field of physical inorganic chemistry has always showcased physical chemistry principles, but King's work, and especially his outstanding introductory text *Chemistry*, illustrate how physical chemistry can be made relevant, fascinating, and intellectually satisfying.

Physical Chemical Analysis of Biopolymer Self-Assembly Interactions by M. T. Record, Jr., and B. Richey is a biophysical chemistry contribution, a field for which undergraduate physical chemistry texts have been available for some years. The authors discuss noncovalent interactions in biological systems, the hydrophobic effect, the polyelectrolyte effect, and several illustrations of the thermodynamics of noncovalent interactions.

The final contribution by S. M. Walas, Computer Methods in the Calculation of Phase Equilibria, is a collection of computer-based applications of physical principles, with BASIC programs, which includes the compressibility of a mixture, vapor-liquid, liquid-liquid, and melt equilibria, activity coefficients, and the relaxation method for chemical equilibria. Chemical engineering has always done a good job illustrating physicochemical principles through computer calculations. Computer computations within the physical chemistry courses taught by chemists have lagged, and continue to do so, behind analogous chemical engineering courses. A curricular revolution in physical chemistry must actively include the robust use of contemporary computer technology. This should not be left to a new generation of physical chemistry educators.

The essays in this sourcebook are useful to both physical chemists and chemical engineers. There is ample new material for both camps. Unfortunately, these disciplines, which share the need for and preach the utility of physical chemistry, must either await other attempts at unification or else continue to acknowledge their intrinsic ethnic diversity.

R. D. Larsen, Texas Tech University

Application of Pattern Recognition to Catalytic Research. By I. I. Iofte (Consultant of Allunion Research and Engineering Corporation of Pulp and Paper Industry, USSR). John Wiley and Sons: New York. 1988. viii + 185 pp. \$74.95. ISBN 0471-919071.

The sort of problem in catalyst research to which the methods of pattern recognition apply is the following. In a paper by Krylov, data on the effectiveness of 26 metal oxides for the oxidation of carbon monoxide are given. This allows them to be classified into three groups: highly active, slightly active, and inactive. Data are also forthcoming on 22 of their thermodynamic and structural properties. On the basis of its known properties, is it possible to predict whether an as-yet-untested oxide will be highly, slightly, or inactive as catalyst for this oxidation? The answer is yes, with a likelihood of between 80 and 90%. The data on the 26 oxides of the training set are first analyzed, and the set of properties on the basis of which the prediction will be made is first trimmed down to eight by the algorithm of "drifting recognition" in which each of the 26 is the subject of prediction from a training set of the other 25 and those properties whose exclusion has no influence on the probability of the prediction are dropped from the set as having no prognostic power. This prognostic power is not to be confused with correlation to activity. Indeed the most influential property (i.e., that which if omitted would most seriously compromise the prediction), the density, is of itself but poorly correlated with the activity. Fifteen other oxides were the subjects of prediction in equations giving nine expected to be highly active and six slightly, but we are only told that one, HFO₂, was confirmed in 1980 as slightly active.

This example is the first given and uses one of the simplest algorithms of pattern recognition. Other problems illustrated are the prediction of

selectivity, the prediction of the value of promoters, and the search for catalysts for known and novel reactions. The monograph is a useful introduction to a class of methods perhaps as yet unfamiliar in catalytic research but which, if used discriminatingly, should be valuable. The introductory chapter is rather too vague to be useful at first reading and the reader may well want to begin with the second (a description of methods) or even the third, where the applications begin, referring back to the methods chapter. The description of the methods is necessarily brief and anyone who really wishes to use them will need to go to the standard references. These are given.

The author is the originator of much of this type of work in the USSR, and it is valuable to have an introduction from a master of the subject. He has been ill-served by a typescript reproduction, which, although accurate, is inexcusable in the age of the laser printer—a point your reviewer would have passed over with a groan, had he not noticed the egregious price.

Rutherford Aris, *University of Minnesota*

Spectroelectrochemistry: Theory and Practice. Edited by Robert J. Gale (Louisiana State University). Plenum: New York and London. 1988. xv + 450 pp. \$85.00. ISBN 0-306-42855-5.

This welcome book provides in-depth and insightful descriptions of several established or emerging spectroelectrochemical methodologies. The aim of the editor was not to be all-inclusive with respect to the field of spectroelectrochemistry. Rather, the focus is on in situ physical techniques for characterizing *interfacial* structure and reactions at metal/solution and semiconductor/solution interfaces.

The treatment of the selected techniques is generally thorough, authoritative, and well-written by experts in the field. The various contributions are similar in their depth of treatment to chapters in leading electrochemical monograph series. Each of the seven major chapters covers a particular methodology with respect to historical perspective, theory, experimental considerations, and applications to interfacial investigations. This format does vary to meet the needs of particular topics. A number of the chapters do a very nice job of intertwining extensive theoretical and experimental results. Most chapters contain detailed and clear-cut descriptions of the important practical aspects of executing a particular spectroelectrochemical experiment. In the first chapter, the editor provides a concise and useful introduction to what follows. The remaining chapters and their authors are X-ray Techniques by J. Robinson, Photoemission Phenomena by R. B. Severeyn and R. J. Gale, UV-Visible Reflectance Spectroscopy by D. M. Kolb, Infrared Reflectance Spectroscopy by B. Beden and C. Lamy, Surface-Enhanced Raman Scattering by R. L. Birke and J. R. Lombardi, ESR Spectroscopy of Electrode Processes by R. G. Compton and A. M. Waller, and Mossbauer Spectroscopy by D. A. Scherson. Kolb's chapter, which is quite impressively written, presents a coherent and insightful account of electroreflectance and related techniques as applied to single crystal electrode surfaces. Birke and Lombardi's well-written chapter on the surface-enhanced Raman effect provides a very detailed and instructive account of this mechanistically challenging area. Other chapters, although not reviewed as extensively, all appear to be well-written and extremely useful. The contributors to this volume have taken care to provide even-handed assessments of the advantages and particular limitations of various techniques. It should be noted that recent developments in X-ray methods, e.g., standing-wave analysis, do make the particular chapter included here somewhat incomplete. In summary, this is an excellent and timely volume that is highly recommended to all researchers and graduate students in the field of interfacial electrochemistry. It should prove to be of benefit to workers already involved with these techniques as well as for the nonspecialist who may be considering one of these techniques for a particular electrochemical research problem.

Edmond F. Bowden, *North Carolina State University*

Volumes of Proceedings

Polymers in Aqueous Media. Performance Through Association. Advances in Chemistry Series 223. Edited by J. Edward Glass (North

Dakota State University). American Chemical Society: Washington, DC. 1989. xiv + 575 pp. \$99.95. ISBN 0-8412-1548-0.

The 28 papers in this book are set in uniform type and are grouped under six headings: Water-Swellable Polymers, Polarity Effects and Polymer Stability, Spectroscopy, Model Associative Thickeners, Associative Thickeners with Commercial Potential, and Commercially Related Associative Thickeners. They are reports of recent research and are intended to "complement and expand on the material covered in *Advances in Chemistry 213, Water-Soluble Polymers*". Author, affiliation, and subject indexes are included.

Organometallics in Organic Synthesis 2. Edited by Helmut Werner and Gerhard Erker (Universität Würzburg). Springer-Verlag: New York and Berlin. 1989. x + 322 pp. \$56.00. ISBN 0-387-50531-8 (paper).

The second symposium supported by the "Volkswagen-Stiftung" on the title subject was held in Würzburg in 1988. The 17 typescript papers include an overview lecture by G. Wilke and a far-ranging variety of subjects, including enantioselective synthesis, inorganic cluster chemistry, metallacycles, etc. It is a pity that there is no index.

Medical, Biochemical and Chemical Aspects of Free Radicals. Volumes 1 and 2. Edited by O. Hayaishi (Osaka Medical College) et al. Elsevier: Amsterdam and New York. 1989. liv + 1560 pp (2 volumes). \$513.25. ISBN 0-444-87482-8.

It required these two thick volumes to reproduce the typescripts of the papers from the 4th Biennial General Meeting of the Society for Free Radical Research, which took place in Kyoto in 1988. Volume 1 contains two "overview" papers and groups of research reports under several headings: Iron, Vitamin E, Antioxidants, and Superoxide Dismutase. Volume 2 contains papers under seven headings: Assay Methods, Lipid Peroxidation, Lipid Peroxide, Prostaglandins, Ischemia-Reperfusion, Pathology, and Cancer. A 7-page subject index and an author index of twice that length are found in Volume 2.

DNA Damage and Repair. Edited by A. Castellani (Department of Environment and Health Protection, Italy). Plenum: New York and London. 1989. xi + 383 pp. \$79.50. ISBN 0-306-43083-5.

The First International Congress on the title subject was held in Rome in 1987 and gave rise to the papers reproduced from typescript in this hardbound volume. They are reports of original research except for a keynote lecture, Twenty-Five Years of DNA Repair, by R. B. Setlow. The subject index is over 6 pages long.

Conformal Invariance and String Theory. Edited by Petre Dita and Vladimir Georgescu (Central Institute of Physics, Bucharest). Academic: Boston and San Diego. 1989. xiii + 557 pp. \$59.95. ISBN 0-12-218100-X.

This book consists of the lectures given at the Summer School on Conformal Invariance and String Theory held in Romania in 1987. The focus of the 16 typescript lectures is theoretical physics. Not indexed.

Books on Applied Subjects

Chemical Protective Clothing Performance Index Book. By Krister Forsberg (AGA, AB) and Lawrence H. Keith (Radian Corporation). Wiley: New York and Chichester. 1989. 308 pp. \$75.00. ISBN 0-471-51430-6.

What gloves to select to protect a chemist from the enormous variety of hazards to which laboratory and manufacturing personnel are subjected is a surprisingly complex question. Apart from simple physical characteristics, such as thickness, the time taken for a specific chemical agent to break through protective material (usually natural or synthetic rubbers) and the subsequent permeation rate are of major importance. The situation with other types of protective garments is similar.

This book is a mass of tables of testing results of a wide range of materials and manufacturers against an even wider range of materials. The permutations are so numerous that the content of the book has been made available in an electronic version. For academic institutions, this book is overkill, but for industrial purposes, it seems to contain the most comprehensive information available, and could enable optimum choices of protective clothing to be made.