Book Reviews*

Phase Transfer Catalysis. By E. V. Dehmlow and S. S. Dehmlow (Universität Bielefeld). Verlag Chemie, Weinheim, West Germany. 1980. vii + 316 pp. $86.30.

Being an author of a book on this subject, I would ordinarily consider it inappropriate to review the competition. Since Dehmlow has reviewed the two other books in this field, however, and suggested that interested parties wait for his offering, it seems fair to analyze the product. Those who waited will find a technically well-produced book at a high price.

The material is presented in three chapters: the first chapter, Ion Pairs and Ion Extraction, is 22 pages, the second chapter, Mechanism of Phase Transfer Catalysis (PTC), is 22 pages, and the final chapter, Practical Applications of PTC, is 224 pages long. This last chapter is broken down into 83 subsections, each of which is titled with equal emphasis making it inconvenient if not difficult to locate specific sections of interest. The sections are numbered as, for example, "3.3.12.10 Organometallic Applications of PTC". This is the tenth subsection of the twelfth subsection of the third subsection in this chapter. The references are separated into individual chapter groups, but they all appear at the end of the book rather than at the end of the chapters. I found this arrangement both illogical and inconvenient. Further, the references in the text are neither in numerical order of appearance nor alphabetical. For example, the citations which appear on page 154 (arbitrarily chosen because it is the exact middle of the book) are 473, 474, 225, 246, 1106, 475, and 1092. It appears that the manuscript was prepared by updating previous reviews without concern for reader utilization. This is certainly a minor point, but it adds to the overall difficulty of using this volume. It seems to me that the purpose of any monograph is both to review and be a convenient source of reference. The poor structure of this book added to the complete lack of an author index makes this book quite inconvenient to use.

On the positive side, this is the most recent book available on PTC and is therefore more up-to-date than any other. It covers the literature through the beginning of 1979, having 47 references (of 1386) to work published that year by workers other than the authors. Our book and that by Starks and Liotta cover the literature only through 1977. This adds about 18 months to the previous offerings.

The exposition is generally clear as are the figures and tables. The few structural peculiarities are those which inevitably result from even the best efforts of the non-chemically trained compositor. As noted above, the printing and binding are generally of high quality. A few amusing statements appear, one of which deserves note here. On page 88 one finds the statement: "Yields are often as high as 80–95%, sometimes much lower".

In summary, it seems fair to say that at a price of $86.30, about twice the price of the competition, this book is not likely to find its way into many personal libraries.

George W. Gokel, *University of Maryland*

Handbook of Anion Determination. By W. John Williams (University of Bath). Butterworths U.S.A., Woburn, Ma. 1979. x + 630 pp. $130.00.

The determination of various anions is an important problem, not only to chemists, but also to biologists, physicists, toxicologists, metallurgists, and engineers. Prior to the publication of this book, there was no single work devoted entirely to the determination of anions. One was forced to consult various texts, treatises, monographs, and the literature to find an appropriate procedure.

In preparing this handbook, the author has critically reviewed thousands of references and, on the basis of his knowledge and experience, has assembled a series of selected procedures for the determination of the anions. Approximately 70 different anions are covered: all of the common ones from acetate to vanadate and several of the less common ones, such as perrhenate, selenocyanate, tetraphenylborate, etc. They consist mainly of inorganic anions but a few of the more commonly encountered organic anions such as acetate, citrate, formate, oxalate, and tartarate also are included. The various anions are arranged alphabetically in the book, except for the halogen anions, the phosphorous oxyanions, and the sulfur anions which are grouped together.

Each anion chapter is similarly structured: A brief general discussion is given first covering the industrial uses and important chemical behavior of the anion. This is followed by sections on separations, gravimetry, titrimetry, spectroscopic methods, electroanalytical methods, and catalytic, kinetic, radiochemical, and thermal methods. This standardized presentation makes it easy to locate the desired information. One or more detailed procedures are given for the determination of each anion. The guiding principles used by the author in selecting procedures have been "wide applicability and an evidence of acceptance by analysts". The author has been careful to select procedures which could be carried out in any modern analytical laboratory by anyone familiar with common chemical laboratory techniques. Most of the procedures involve titrimetric or spectrophotometric methods, and to a lesser extent gravimetric and instrumental methods. The fundamental chemistry involved in each of the determinations is briefly discussed. Thus one is better able to understand the rationale of the method and the problems and difficulties associated with it. Directions for preparing the necessary reagents are included, along with the procedures. Data on the range, accuracy, and interferences also are discussed.

The length of each section is related to the importance of the anion. The chloride anion, for example, encompasses approximately 40 pages, whereas the tetraphenylborate anion only 1.5 pages. Each section is documented by a list of references. They consist mostly of recent work done during the past 20–30 years. In the author's words: "Although of historical interest, much of the older work bears little relation to current analytical practice. There seemed to be no point in digging up bones yet again to move them to a new cemetery." In the references the author has taken pains to include one or more review articles which he points out to those who wish more in-depth information. The book contains an excellent index where the anions are cross-referenced under such items as auto-exhaust, blood serum, seawater analysis, rocks, and steel analysis, to quote just a few examples.

The book is well organized and clearly written. It is much more than just a book of laboratory procedures. It contains a wealth of information concerning the anions, their chemistry, and analysis. It is recommended for libraries and laboratories associated with any aspect of anion analysis.

Richard B. Hahn, *Wayne State University*

Polarography of Molecules of Biological Significance. Edited by W. Franklin Smyth (Chelsea College, University of London). Academic Press, New York. 1979. xx + 326 pp. $47.50.

This book is devoted to the voltammetric determination of molecules of biological significance. The emphasis is on analytical applications with some description of techniques. The first two chapters deal with analytical and electrochemical methodology. Practical analytical considerations such as choice of method, sampling, separation, and derivatization are considered in Chapter 1. Chapter 2 describes the commonly used electroanalytical techniques and discusses points to consider in selecting the optimum technique for a particular situation. Cells, electrodes, supporting electrolytes, and instrumentation are also described. The subsequent eight chapters deal with the electrochemical behavior of organic and organometallic compounds with analytical applications. They are organized in topical sections: pharmacy and pharmacology, basic medical sciences, environmental science, and agriculture. These chapters discuss analytical applications with some discussion of mechanisms or electrode processes. The book contains a wealth of information and references. As such it should be useful to anyone interested in the determination of organic and organometallic compounds by electroanalytical methods.

William R. Heineman, *University of Cincinnati*

Organometallic Mechanisms and Catalysis. By Jay K. Kochi (Indiana University). Academic Press, New York. 1978. xvii + 571 pp. $59.50.

This book is a successful attempt at systematizing mechanistic organometallic chemistry. The author has combined the usually disparate treatments which emphasize either concerted or homolytic mechanistic pathways in organometallic and metal-catalyzed organic reactions, and this unified approach avoids some of the problems of the separate treatments and provides fresh perspectives on the field.

The book is divided into three parts. Part I, on oxidation–reduction processes (226 pages), discusses free-radical and radical-chain processes in metal-catalyzed reactions such as organic oxidations, additions to olefins, and reductions of organic halides. Part II, on the chemistry of organometals (215 pages), deals with concerted (two-equivalent) decomposition pathways, homolytic (one-equivalent) pathways, and catalytic carbon–carbon bond formation. Part III, on charge-transfer interactions (130 pages), covers the role of charge transfer in cleavage reactions and in reactions where the organometallic species acts as either a donor or acceptor; electrophilic attack on organometallic complexes is included

*Unsigned book reviews are by the Book Review Editor.

also in this section. Mechanistic data are heavily emphasized throughout the book, and there are many tables that summarize kinetic parameters.

Inorganic, organometallic, and other chemists with interests in metal-mediated organic synthesis will find this book valuable, particularly because of the large number of literature citations (approximately 2900) and suggested readings (70).

Louis Messerle, *University of Michigan*

Radiationless Transitions. Edited by Sheng Hsien Lin (Arizona State University). Academic Press, New York. 1980. xi + 425 pp. $48.50.

This book is a collection of nine topical chapters by invited authors with the purpose of presenting a "more detailed analysis of recent experimental work on small polyatomic molecules of other studies relevant to the electronic relaxation of these small molecules."

The introductory chapter includes a straightforward theoretical introduction to concepts and introduces prevalent terminology, then reviews a number of experimental results for a variety of small molecules. Later chapters are more specialized and detail various aspects of relaxation processes such as rotational effects, relaxation of isolated molecules, details of optical preparation effects, condensed phase relaxation, and ultrafast relaxation processes.

This collection of contributions is primarily useful to graduate level students whose primary interests lie in the field of intramolecular dynamics and to researchers whose areas of interest lie closely attached to important developments in this field. The developments are detailed and technical and are thus not necessarily suited to the casual interest reader.

J. Gary Pruett, *University of Pennsylvania*

Weak Intermolecular Interactions in Chemistry and Biology. By P. Hobza and R. Zahradnik (The Institute of Hygiene and Epidemiology, Centre of Industrial Hygiene and Occupational Diseases, and The Institute of Physical Chemistry and Electrochemistry of the Czechoslovak Academy of Science). Elsevier Scientific Publishing Company, Amsterdam, The Netherlands, and New York. 245 pages. $48.75/Dfl. 100.00.

The objective of this monogram is to present a survey of both the theoretical and experimental developments of weak interactions, primarily since 1970. The text is divided into four major sections: introduction; methods for the calculation of weak interactions; experimental methods; and applications.

Weak interactions are characterized in the introduction (Chapter I) of the text as having shallow minima at distances of 0.2–0.5 nm between subunits, the absence of an activation energy, and a relatively small contribution of exchange integrals in the quantum mechanical description of the system. Schematic representations of mono- and multipole interactions and their corresponding mathematical forms of interaction energies are also presented in this section.

The section on computational methods (Chapter II) is subdivided into five parts: the variation method; the perturbation method; empirical methods; hybrid methods; and the molecular electrostatic potential. The authors assume the reader is familiar with the concepts and development of each method. The discussion is focused primarily on the difficulties encountered with these approaches. Topics covered include the effects of geometry of interacting systems, additional expansion terms in the interaction potential (quadropole, octopole, etc.), and the choice of basis set on the calculation of the interaction energy. Of the 294 references used to illustrate the various points, over 280 were published after 1970.

The third major section is on experimental methods. This is the weakest component of this monograph, spanning only 13 pages and 46 references. The methods surveyed include elastic scattering of molecular beams, spectroscopic methods (radio frequency, infrared, and electronic spectroscopy), and transport properties. Equations are presented only for the latter category and then only to define an empirical parameter in terms of some molecular process involving undetermined parameters. For example, the diffusion coefficient D is given in terms of the absolute rate model,

$$D = \lambda^2 \frac{kT}{h} \frac{F^{\ddagger}}{F} \exp(-\epsilon_0/kT)$$

where F and $F^{\ddagger}$ are partition functions for initial and activation states of the molecule, respectively, and λ is the distance between successive equilibrium positions. The authors do not discuss how D is obtained experimentally nor is it clear how the authors intended to relate the above form for D to the interaction potential between particles.

Chapter IV is a survey of 449 references on applications. Topics presented cover electron donor–acceptor complexes, the hydrogen bond, penning ionization electron spectroscopy (these systems represent van der Waals systems), heat of vaporization, inert gas distribution between two immiscible liquids, physical adsorption, and solvation energy (these systems represent interactions of large sets of systems). The examples primarily focus on molecular systems containing 16 or less atoms, such as $CH_3COOH\cdots C_2F_6$, $OC(CN_2)_2\cdots H_2O$, $NH_2CHO\cdots NH_2CHO$, $Li(H_2O)_4^+$, and $(CH_3)_2CO\cdots H_2O$. The main references to biological systems are a brief mention of the stacking interactions between the purine and pyrimidine bases (page 152), a single paragraph in the section on hydrogen bonds (page 176), and the hydration of histamine (page 207). In this sense the title of the monograph is somewhat misleading with the inclusion of "and Biology".

The authors present an interesting survey of the theoretical results on weak interacting systems over the last decade.

Kenneth S. Schmitz, *University of Missouri—Kansas City*

Enzyme Engineering. Future Directions. Edited by Lemuel B. Wingard, Jr. (Department of Pharmacology, University of Pittsburgh), and Iia V. Berezin and Anatole A. Klyosov (Moscow State University). Plenum Press, New York and London. 1980. xiv + 521 pp. $59.50.

The contents of this book are based on the Proceedings of the Conference on the Future of Enzyme Engineering Development, held in Tbilisi, Georgian S.S.R. in 1978. The Soviets have had an active research and development program in the study and application of soluble and immobilized enzymes since 1970 and the results are impressive. This book should find a wide audience among engineers, chemists, biochemists, and physicians. The first section is concerned with the stabilization and reactivation of enzymes and the theory of reliability and kinetics of inactivation of biocatalytical systems. This is followed by three papers concerned with carbohydrate conversions with enzymes, enzymatic conversion of cellulose to glucose, immobilized amyloglucosidase, and substrate stabilization of soluble and immobilized glucoamylase against heating. The section on biomedical possibilities of enzyme engineering includes such titles as chemical aspects of enzyme stabilization and modification for use in therapy, modification of trypsin pancreatic inhibitor by polysaccharides for prolongation of therapeutic effect, enzymatic modification of β-lactam antibiotics, modification of enzymes with water soluble polymers, and immobilized enzymes and other materials for the study of mammalian cell surfaces. One of the most interesting papers is titled application of immobilized enzyme systems in nonsilver photography. Articles concerned with microorganisms as hydrogen and hydrogenase producers, spatially structured enzyme support arrangements in electrochemical systems, fine chemical processing, and problems of efficiency and optimization complete the fourth section. In the section on enzymes in food and nutrition are found discussions of production of L-malic acid, application of plant phenol oxidases in biotechnological processes, and immobilized enzymes in nutritional applications. The last two papers are concerned with the impact of enzyme engineering on science policy and future prospects. References and an index are included.

M. C. W. Smith, *Ann Arbor, Michigan*

Food Additives. By R. J. Taylor (formerly of Unilever research, now deceased). John Wiley and Sons, New York. 1980. xv + 126 pp. $30.00.

The purpose of this book is to present the case for food additives to interested lay people and science students. The first chapter deals with the origins and development of food sources and points out that many of our common foods naturally contain toxic materials. Chapter two is titled, The Case for Food Additives. The character of additives is discussed in chapter three and includes antioxidants, preservatives, emulsifiers and stabilizers, food colors, flavors, sequestrants, anticaking agents, acids, buffers and bases, humectants, firming and crisping agents, sweeteners, enzymes, nutritive additives, flour and bread additives. Chemical structures are frequently given. Next come chapters devoted to legislative processes, food and agriculture organization, and safety testing. Toxic materials in natural foods and food additive compilations are included in two appendices. An index and references are included.

M. C. W. Smith, *Ann Arbor, Michigan*

27th International Congress of Pure and Applied Chemistry: Plenary Invited Lectures. Edited by A. Varmavuori. Pergamon Press, Oxford and New York. 1980. vii + 386 pp. $100.00.

The lectures, with tables, figures, and references, given at the 27th IUPAC Congress held in Helsinki in 1979 are collected in this book and reproduced directly from the authors' original typescripts. The five plenary lectures are all biochemically oriented. The invited lectures, of which there are 31, come under six headings: Trace Element Analysis; Modern Methods in Clinical Chemistry; Analysis and Structure of Cell Membrane Carbohydrates; Chemistry and Technology of Natural Polymers and their Degradation Products; Biotechnology and Bioengineering; and Chemometrics. All the texts are in English. It is a pity there is no index.