surface sites are coordinatively unsaturated. The chemical potentials[8] of these surface sites may also be different than bulk sites.

To summarize, the present work demonstrates that during heating to 823 K, Ag$^+$ and Cs$^+$ ions migrate to the external surface of the zeolite. Under exposure to light, Ag$^+$ ions in these zeolites are reduced to elemental Ag(0) as determined by XPS.[15] Such species have been proposed to be active in water splitting reactions[10] and have also been characterized by electron spin echo and electron spin resonance experiments.[11] Taken together these results illustrate that surface metal ion enhancements occur during thermal treatment of zeolites. Normal XPS measurements[12] do not allow the observation of such surface enhancements because the sampling depth of the XPS experiment is too large to distinguish this thin surface layer of metal ion enhancement. Our results suggest that an integrated surface analysis of these types of materials is superior to the use of any one single method. Surface metal ion enhancements should be considered when these materials are used for adsorptive and catalytic purposes.

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(8) Barthomeuf, D. *J. Phys. Chem.* **1979**, *83*, 249.

(9) Pinnavaia, T. J.; Tzou, M. S.; Landou, S. D. *J. Am. Chem. Soc.* **1985**, *107*, 4783.

(10) Jacobs, P. A.; Uytterhoeven, J. B.; Beyer, H. K. *J. Chem. Soc., Chem. Commun.* **1977**, 128.

(11) Narayana, M.; Kevan, L. *J. Chem. Phys.* **1982**, *76*, 3999.

(12) Angular resolved XPS experiments[14] may allow the observation of such surface metal ion enhancements for these samples. Such studies are under way in our lab.

(13) Prolonged X-ray bombardment causes reduction of Ag$^+$ ions to Ag(0). Therefore, a new sample of the same batch of zeolite was analyzed after heating in the spectrometer with SIMS and ISS prior to a final XPS measurement.

(14) Baird, R. J., Fadley, C. S.; Kawamoto, S. K.; Mehta, M.; Alvarez, R.; Silva, J. A. *Anal. Chem.* **1976**, *48*, 843.

(15) Minachev, Kh. M.; Antoshin, G. V.; Shapiro, E. S.; Yusifov, Y. A. *Proc. Int. Congr. Catal., 6th, 1976* **1977**, 621.

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*Book Reviews**

Metalloproteins. Part 1: Metal Proteins with Redox Roles. Part 2: Metal Proteins with Non-redox Roles. Edited by Pauline M. Harrison (University of Sheffield, England). Verlag Chemie: Deerfield Beach, FL 33442-1705. 1985. Part 1: xi + 256 pp. $55.00. ISBN 0-89573-120-6. Part 2: xii + 339 pp. $66.00. ISBN 089573-211-4.

These two volumes represent numbers six and seven in a series on "Topics in Molecular and Structural Biology". Taken together, they offer a major slice of what we know about metalloproteins. The first volume presents six articles which deal with metal proteins with redox roles, as follows: Structure and Function of Small Blue Copper Proteins; Cytochromes *c* and Cytochromes *c* Containing Enzymes; Iron–sulfur Proteins; Superoxide Dismutases; Structure and Chemistry of Cytochrome P-450; and Nitrogenase. In Part 2, devoted to metal proteins with non-redox roles, there are six more articles, as follows: Metalloproteinases; a Comparative Study of the Occurrence, Structure and Function of Troponin C and Calmodulin; Structure and Mechanism of the (Na$^+$, K$^+$) and (Ca^{2+})-ATPases; Metallothionein; Transferrins; and Oxygen Carrier Proteins.

As carefully explained by Pauline M. Harrison in two informative prefaces, her objective was to provide fresh and stimulating reviews of metalloproteins. Most of the twelve articles are timely and well written with appropriate depth, attesting to the success of her mission. However, several important topics were neglected as a result of the selection and organizational process. The reference to cytochrome *c* oxidase does not match up to its role as the most important oxidative enzyme in aerobes. Ceruloplasmin (ferroxidase), the blue copper protein of vertebrate plasma, is mentioned only once, despite the fact that this essential metalloprotein combines both redox and non-redox roles. Also lost was an opportunity to recognize the monumental achievement of Frank W. Putnam and co-workers, who in 1983 announced the complete amino acid sequence of ceruloplasmin, a single-chain metalloprotein of 1064 amino acids and six copper atoms. None of these suggestions should detract from the value and the usefulness of these two volumes to the growing literature on metalloproteins and inorganic biochemistry.

Earl Frieden, *Florida State University*

Catalysis, Science and Technology. Volume 7. Edited by J. R. Anderson (CSIRO Division of Materials Science) and M. Boudart (Stanford University). Springer-Verlag: New York. 1985. v + 222 pp. $49.50.

This book is Volume 7 of a series on heterogeneous catalysis which, as the editors correctly point out, is neither an "advances" nor a review series, but rather a collection of special topics. The topics in this issue include a chapter on the history of the catalytic synthesis of ammonia by S. A. Topham, a chapter on electron microscopy by J. V. Sanders, and a chapter on surface structures by B. E. Koel and G. A. Somorjai.

The chapter on ammonia synthesis is a fascinating presentation which places this technologically important process in a proper perspective with respect to the impact of science and engineering on human affairs. The discovery of catalysts by Fritz Haber and later by Alwin Mittasch, the process development of Carl Bosch, and the financial support by BASF established a pattern which subsequently has been repeated, to varying degrees, throughout the chemical industry.

The second chapter, which covers scanning electron microscopy (SEM), transmission electron microscopy (TEM), and scanning transmission electron microscopy (STEM), is an adequate introduction to these important techniques, although it suffers somewhat from organizational problems. Throughout the chapter, Sanders is very careful to point out limitations in the techniques and to direct the reader to the original literature for more comprehensive discussion.

In the final chapter, two surface-analysis techniques, low-energy electron diffraction (LEED) and high-resolution electron-energy loss spectroscopy (HREELS), are shown to be of major importance in structural determinations of the solid phase and the adsorbed phase. This structural information, which is largely restricted to metal single crystals, is essential for understanding catalysis on these materials at the most fundamental level.

This volume will be useful as a reference to those who are working in the field and for those who are interested in the history of science and technology (Chapter 1).

Jack H. Lunsford, *Texas A&M University*

Houben-Weyl Methoden der Organischen Chemie. 4th Edition. Supplement Volume E11: Organische Schwefelverbindungen, Parts 1 and 2. Edited by D. Klamann. Georg Thieme Verlag: Stuttgart. 1985. lxxiv + 1821 pp. DM 1950.00 (ca. $875.00). ISBN 3-13-218104-8.

This remarkably thorough work brings the subject of organic sulfur chemistry up to date from the original work (Volume 9) published in 1955 to 1984. All types of sulfuriferous functional groups except the sulfur derivatives of the carboxyl group are included, from mercaptans to esters of sulfuric acid. The 1955 volume required only about half so many pages to cover the same subject, a fact that brings to the fore the dramatic increase in publication on the subject in the last 30 years.

The exposition of the material in this work has evidently been given much more than the usual care and thought. It is hard to find a page without equations and structures. The latter are of outstanding clarity, and in addition, quick recognition of the part that is undergoing change is aided by setting that part in heavy type. The defective state of the nomenclature of organic sulfur compounds and the consequent uncertainity among many chemists about the names by which sulfur functional groups are known have been recognized; the very extensive table of contents contains prominently displayed part-structures as well as words. Even so, the nomenclature used has been carefully considered, and one sees "sulfane", a systematic name for the parent compound H_2S, used in combination form when it improves comprehension (e.g., "diorganooxysulfane", R^1-O-S-O-R^2, and "dialkoxydisulfane", R^1-O-S-S-O-R^2).

The coverage is not restricted to open-chain structures, although the focus of the work is on functional groups. A substantial amount of material on sulfur heterocycles is given in those areas in which other review sources are not available. Thus, thietes, thiirenes, thiazetidines, and thiapyrans are discussed, but not thiophenes or thiazoles.

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*Unsigned book reviews are by the Book Review Editor.

The two parts share an index of 167 pp. which is actually subdivided into several indexes (e.g.. "open-chain compounds", "dispiro compounds", etc.). It is an index of compounds. except for a short (6 pp) section on Name Reactions. Classes. Trivial Names. and General Concepts. Although it is for the most part extraordinarily complete. some subjects have fallen though the cracks. and "Lawesson's reagent". for example. is not in the index.

The thoroughness and richness of content (many explicit laboratory procedures and thousands of references) make this supplement a major work in its own right and an indispensable resource for chemists concerned with synthesis of sulfur compounds.

Organometallic Compounds of Cobalt, Rhodium and Iridium. Edited by C. White (University of Sheffield). Chapman and Hall: London and New York. 1985. xi + 291 pp. $40.00. ISBN 0-412-26800-0.
Organometallic Compounds of Germanium, Tin and Lead. Edited by P. G. Harrison (University of Nottingham). Chapman and Hall: London and New York. 1985. xi + 180 pp. $33.00. ISBN 0-412-26810-8.
Organometallic Compounds of Iron. Edited by G. R. Knox (University of Strathclyde). Chapman and Hall: London and New York. 1985. xi + 477 pp. $49.95. ISBN 0-412-26820-5.
Organometallic Compounds of the Lanthanides, Actinides and Early Transition Metals. Edited by D. J. Cardin (Trinity College. Dublin). S. A. Cotton (Stanground School. Peterborough). M. Green (University of Bristol). and J. A. Labinger (Atlantic Richfield Co.). Chapman and Hall: London and New York. 1985. xi + 400 pp. $49.95. ISBN 0-412-26830-2.
Organometallic Compounds of Nickel, Palladium, Platinum, Copper, Silver and Gold. Edited by R. J. Cross (University of Glasgow) and D. M. P. Mingos (University of Oxford). Chapman and Hall: London and New York. 1985. xi + 333 pp. $40.00. ISBN 0-412-26840-X.
Organometallic Compounds of Ruthenium and Osmium. Edited by G. R. Knox (University of Strathclyde). Chapman and Hall: London and New York. 1985. xi + 283 pp. $40.00. ISBN 0-412-26850-7.
Organometallic Compounds of Silicon. Edited by D. R. M. Walton (University of Sussex). Chapman and Hall: London and New York. 1985. xi + 318 pp. $40.00. ISBN 0-412-26860-4.
Organometallic Compounds of Zinc, Cadmium and Mercury. Edited by J. L. Wardell (University of Aberdeen). Chapman and Hall: London and New York. 1985. xi + 207 pp. $33.00. ISBN 0-412-26870-1.

Together with a volume on compounds of boron (reviewed here. Vol. 108: 355). this group of softbound books is the beginning of a series. the Chapman and Hall Chemistry Sourcebooks. These volumes are compilations of data previously published in a different arrangement in the "Dictionary of Organic Compounds". a comprehensive work published in 1984. In these new volumes. the compounds of specific elements have been lifted from the comprehensive work and reassembled into homogeneous units. The form of the entries remains the same: concise entries. devoid of discursive text. giving structure. name. physical properties. and key references. The arrangement is in formula index order. which facilitates finding the many compounds whose names are complex and obscure. Presumably the content has not been altered from the source from which it was drawn. for no contrary statement appears in the preface. The value of these works lies in the fact that they concentrate the information in which an individual chemist may have special interest and make it available at a price suitable for personal purchase.

Houben-Weyl Methoden der Organischen Chemie. Band V/2c: Carbocyclische π-Elektronen-Systeme. 4th Edition. Edited by H. Kropf. Georg Thieme Verlag: Stuttgart. 1985. xlvii + 870 pp. DM 940.00 (ca. $440.00). ISBN 3-13-202804-5.

This volume is divided into three sections: Conjugated Carbocyclic Cations and Anions; Condensed Carbocyclic Systems; and Cross-Conjugated Systems. The first section. the shortest. deals with tropylium ions. cyclopropenyl radicals. and anions. etc. The second section consists largely of azulene and its derivatives. along with their parts dealing with pentalenes. heptalenes. and pleiadenes. The third section is most heavily concerned with cyclopentadienes. but it covers the field from cyclopropenes to cyclononatetraenes. The exceptionally thorough indexes occupy 77 pages.

As is customary in this work. pride of place is given to preparative methods. which are presented in a systematically organized fashion. Large numbers of examples are set out in equations with well-drawn structures; in addition. there are many tables. in which one finds yields and properties of products. Discussions of reactions of the compounds follow. All statements are meticulously referenced. with some citations as recent as 1985. Representative experimental procedures are an important and useful feature of all sections.

"Houben-Weyl" continues in its tradition of a high quality of production and a degree of thoroughness and organization not often met with. The result is a work unrivalled in its area. It merits a place in all libraries consulted by organic chemists.

Selected Works of Paul J. Flory. Edited by Leo Mandelkern. James E. Mark. Ulrich W. Suter. and Do Y. Yoon. Stanford University Press: Stanford. CA. 1985. 2633 pp (3 volumes). $165.00. ISBN 0-8047-1277-8.

Paul Flory's name is recognized and his work is held in high esteem wherever polymer chemists are found. and it is a fitting tribute to his accomplishments that this collective work should appear to honor his 75th birthday. which is only 1 year short of the 50th anniversary of the publication of his first paper on polymer chemistry. and one year more than the tenth anniversary of the award to him of the Nobel Prize in Chemistry.

Three thick volumes though it is. this work does not contain all his publications. A committee of editors did their best to select the most significant ones. which they have arranged in a logical order according to the development of a subject. rather than in chronological order. The first volume contains a list of honors and awards. a short autobiography. and Professor Flory's Nobel Prize lecture. as well as groups of papers on Polymerization. Frictional Properties. and Thermodynamics of Polymer Solutions. Volume II is devoted entirely to papers on Chain Configuration and Dependent Properties. Volume III contains groups of papers on Rubberlike Elasticity. Crystallization. and Liquid Crystals. as well as a list of Professor Flory's publications in chronological order. keyed to the page where its reprint in this work begins. Otherwise there is no index.

A Practical Guide to Enzymology. By Clarence H. Suelter (Michigan State University). John Wiley & Sons: New York. 1985. xiii + 288 pp. $45.00. ISBN 0-471-86431-5.

The stated purpose of this monograph is "to bring the practical elements of experimental enzymology together in one small volume". Although there are minor omissions of very recent developments. the author has done an admirable job in fulfilling his objective. The book is based at a level sufficiently high to be of use to research biochemists while still being intelligible to students with only an introduction to biochemistry.

The text is divided into five chapters. After chapter one. which is a discussion of the theory of protein structure and stability. the author emphasizes experimental methods and the interpretation of results. Since large amounts of material are covered in a small number of pages. most topics are not presented in depth. but ample references (747 total) are provided as a source of more detail.

Chapter two discusses methods of determining protein concentration and enzyme activity. Practical suggestions on pH, temperature. and concentration will be especially helpful to the non-enzymologist. An error occurs on page 47, where the activity unit katal is defined as "the amount of enzyme that transforms one mmol of substrate in one second". The sentence should have read one mole of substrate in one second.

Chapter three contains a thorough review of enzyme purification strategies. Topics range from choosing a tissue and preparing the crude extract. through the many traditional types of chromatographic separations. to more current techniques such as high-performance liquid chromatography (HPLC). A section on how to choose the best sequence of fractionating steps will be valuable to those without experience in enzyme isolations. One additional note could have been added to the sections on rapidly evolving techniques such as HPLC. advising the reader on appropriate literature sources to consult for the most recent information on methods and commercial availability of materials.

The fourth chapter presents methods for studying the physical and chemical properties of a protein. A partial list of topics covered includes ultraviolet-visible spectrophotometry. fluorescence measurements. molecular weight determination. amino acid composition and sequence. peptide mapping. and methods for the study of protein topography. Conforming to the practical nature of the book. the author concentrates on experimental procedures and potential problems. with numerous references (231) for more information.

The last chapter of the book is concerned with protein–ligand complexes and enzyme kinetics. Various methods are presented for the determination of both the dissociation constant and the stoichiometry of complexes. Some representative sections on enzyme kinetics are titled Determining Initial Velocities. Designing a Kinetic and Binding Experiment. and Analysing Kinetic and Binding Data. References are given for more theoretical treatments of kinetics.

Overall the book is a concise and informative discussion of the design and interpretation of experiments for a wide range of topics in enzymology. This monograph should prove useful as a reference book for anyone using enzymes in research and may also find a place in an advanced biochemistry laboratory course.

James S. Swan, *Bucknell University*

Standard Potentials in Aqueous Solution. (Monographs in Electroanalytical Chemistry and Electrochemistry Series. Volume 6). Edited by Allen J. Bard (University of Texas). Roger Parsons (Laboratoire d'Electrochemie Interfacial du CNRS & The University. Southampton). and Joseph Jordan (The Pennsylvania State University). Marcel Dekker. Inc.: New York. 1985. xii + 834 pp. $29.95. ISBN 0-8247-7291-1.

This book is written with the stated objective of providing a modern replacement for Latimer's classic (1952) "Oxidation Potentials". Its chapter organization is identical with its predecessor's with only a few exceptions: the section on yttrium has been moved from the chapter on B. Al. and Sc to that on La and the lanthanides. several of the appendices have been removed. and a new chapter has been included on the rare gases. This latter change was deemed important enough that the Latimer diagram for Xe embellishes the bookcover. The other major difference between the two volumes is that this new version is an edited work: there is a different author for almost every element. and each chapter is reviewed by an independent chemist. It follows Latimer's tradition in presenting tables of thermodynamic data (taken largely from the new NBS Tables). standard potentials interspersed throughout the text. and substantial sets of references. There are more than twice as many pages as in Latimer's version.

The multiauthor nature of the book has inevitably led to some unevenness in presentation. Thus some of the chapters are more up to date than others. The chapter on N is somewhat shorter than Latimer's. while the chapter on Mo exceeds Latimer's by a factor of 7. I will resist the temptation to list the errors I have found (not very many). but I was dissappointed to find so few potentials listed for free radicals. The potentials for the halogen atoms are now rather well established. and the determination of the potentials for Tl(II) surely is one of the highlights in modern thallium chemistry: however. these topics are absent.

Overall the book is a success. It has replaced Latimer's volume on my desk. It belongs in every chemistry library. and its low price should make it available to both professional chemists as well as students. The editors. authors. and IUPAC Commisions I.3 and V.5 are to be thanked for providing this valuable resource.

David M. Stanbury, *Rice University*

Advances in Photochemistry. Volume 13. Edited by David H. Volman. Klaus Gollnick. and George S. Hammond. John Wiley and Sons: New York. 1986. xi + 500 pp. $79.95. ISBN 0-471-81523-3.

Volume 13 of this highly regarded series is a refreshing and welcome sequel. considering the lapse of six years since Volume 12 was published. It consists of six comprehensive chapters: (1) Photodissociation Dynamics of Small Molecules by W. M. Jackson and H. Okabe. (2) Quantum Theory of Polyatomic Photodissociation by V. Z. Kresin and W. A. Lester. Jr.. (3) Bimolecular Photochemical Reactions of the Stilbenes by F. D. Lewis. (4) Photoinduced Electron Transfer in Organic Systems: Control of Back Electron Transfer by M. A. Fox. (5) Chemical Sensitization. Spectral Sensitization and Latent Image Formation in Silver Halide Photography by T. H. James. and (6) Dye Sensitized Photopolymerization by D. F. Eaton. Each of the chapters is well written by recognized experts in their field. who provide an efficient access to the recent developments of the above photochemical topics. The reviews have extensive citations to the literature. including 1984 and 1985. with the chapter on photoinduced electron having 310 references.

The editors are to be commended for their plan to shorten the time interval between published volumes. with number 14 to be expected in 1987 and number 15 in 1988. With the continued excitement in photochemistry there should be no difficulty in fulfilling their goal.

The subjects chosen represent an excellent compromise between theoretical and experimental aspects and practical applications of photochemistry. Chapters 1 and 2 effectively address the experimental and theoretical aspects of the photodissociation of small molecules. Chapter 3 deals with larger molecules. i.e.. stilbenes. and nicely puts into perspective the accomplishments in this field. Chapter 4 is very well written and illustrates many of the ways in which back electron transfer may be obviated with the intent of producing photochemistry. The final two chapters (5 and 6) address two important photochemical areas of industrial interest. i.e.. silver halide photography and photopolymerization. respectively. Both of these chapters do an excellent job of outlining the problems and solutions to the many facets of photoimaging. which is estimated to be a 17-billion-dollar industry. There is a subject index; however. of greater value is the cumulative index of Volumes 1–13 which provides convenient access to the articles of the whole series.

In summary. this is a commendable addition to the series that will continue to appeal to the photochemistry research community. It is recommended for all libraries and for those actively engaged in photochemical research.

Anthony C. Testa. *St. John's University*

Asymmetric Catalysis. Edited by Brice Bosnich (University of Toronto). Martinus Nijhoff Publishers: The Netherlands. 1986. vii + 160 pp. $45.50. ISBN 90-247-3259-X.

This monograph is a member of the NATO Advanced Science Institute series. It presents a report covering a workshop held in January 1984 dealing with the title subject. The eleven participants are all well versed in various aspects of catalysis. The editor notes that nearly 200 typed pages of topic summaries were generated and edited into a very informative. readable text. The eight chapters (General Principles. Carbon–Hydrogen Bond Formation. Carbon–Carbon Bond Formation. Asymmetric Oxidation. Heterogeneous and Polymer Supported Catalysts. Asymmetric Catalysis by Biochemical Systems. Economic Significance of Asymmetric Catalysis. and Future Trends) deal with somewhat broad topics. Subchapters serve to break each main topic into more descreet bites (e.g.. Asymmetric Catalytic Hydrogenation. Asymmetric Hydrogenation of Ketones. Asymmetric Double Bond Migration. and Asymmetric Hydrosilylation in the Carbon–Hydrogen Bond Formation chapter).

The primary focus of this work is on the mechanistic aspects of asymmetric catalysis. Specific examples from the literature or the participants' work serve to illustrate various points of discussion. Experimental detail is not included; however. literature references are present so the interested reader may consult the original work.

"Asymmetric Catalysis" presents an overview of the state of the art of this important subject (as of early 1984). It would be appropriate to any graduate level course in Organometallic. Catalytic. or Synthetic Chemistry. It would also serve as an effective primer for anyone considering serious research in this rapidly expanding field.

James A. Thomas, *Warner Lambert Co.*

Studies in Physical and Theoretical Chemistry. Volume 38. The Chemical Physics of Solvation. Part A: Theory of Solvation. Edited by R. M. Dogonadze (Georgian Academy of Sciences). E. Kálmán (Hungarian Academy of Sciences). A. A. Kornyshev (Academy of Sciences of the USSR). and J. Ulstrup (Technical University of Denmark). Elsevier Science Publishers: Amsterdam and New York. 1985. xxx + 555 pp. $120.50. ISBN 0-444-42551-9.

This is the first of a three-volume monograph series that will cover the subject of solvation. This volume discusses the theory of solvation. while the subsequent volumes will treat the topics of the spectroscopy of solvation and of solvation phenomena in specific systems.

This first volume subdivides the discussion of the theory of solvation into five sections: Introduction (1 chapter). Fundamentals and Phenomenology (5 chapters): Quantum Chemistry. Computer Simulation. and Statistical Geometry (4 chapters): Hydrophobic Solvation Effects (1 chapter); and Solvation Effects in Electron Systems (2 chapters). The 13 chapters in this volume [topics. authors (pages. references)] are the following: Theoretical Approaches to Solvation. R. R. Dogonadze. A. A. Kornyshev. and J. Ulstrup (33. 87); Methods of Quantum Field Theory in Electrodynamics of Solvation. R. R. Dogonadze and T. A. Marsagishvili (38. 15); Nonlocal Electrostatics of Solvation. A. A. Kornyshev (42. 67); Semi-Macroscopic Models of Ionic Solvation. J. Liszi and I. Ruff (23. 40); Molecular Description of Ionic Solvation and Ion–Ion Interactions in Dipolar Solvents. L. Blum and F. Vericat (63. 96); Approaches to the Many-Body Theory of Dense Ion–Dipole Plasma—Application to Ionic Solvation. M. F. Golovko and I. R. Yukhnovskij (56. 97); Ion–Molecule Interactions—A Quantum Chemical Approach to Primary Solvation. A. Karpfen and P. Schuster (49. 86); Computer Simulation of Ion–Solvent Systems. K. Heinzinger and G. Pálinkás (41. 62); Models for the Structure of Hydrated Shells of Simple Ions Based on Crystal Structure Data and Computer Simulation. G. G. Malenkov (35. 55); Microdynamics of Solvation. M. N. Buslaeva and O. Ya. Samoilov (24. 102); Hydrophobic Effects in Ionic Hydration and Interactions. J.-Y. Huot and C. Jolicoeur (55. 245); Solvation in an Electron Gas. M. Manninen and J. K. Nørskov (32, 94); Electrons on the Helium Surface. V. B. Shikin (31. 55).

This monograph gives an excellent introduction into the many theoretical approaches taken to try to describe and understand the various solvation phenomena. The authors of most chapters have given a rather broad survey of both the historically important and the modern methods. Although most chapters assume a (necessarily) highly mathematical posture at first. they usually also illustrate results of application of the theories in terms of experimentally relevant quantities and parameters by using graphs and tables of data and parameters.

Earl M. Woolley, *Brigham Young University*

Electron Spin Resonance. Volume 9. Edited by P. B. Ayscough (University of Leeds). Royal Society of Chemistry: London. 1985. xi + 387 pp. $95.00. ISBN 0-85186-831-2. Available from the ACS.

This volume presents 9 review chapters of electron-spin resonance literature published between December 1982 and May 1983. Although the "special review chapter" was eliminated for size considerations, fairly comprehensive coverage across the fields was achieved by retaining the traditional topics. These include the theoretical aspects, transition metal ions, inorganic and organometallic radicals, organic radicals in solids and in solutions, applications to polymer, spin labeling, metalloproteins, and medicine.

In the theoretical section it is expected that the age of sophisticated computers should afford the opportunity for ab initio calculations as almost a routine for new experimental results. The chapter on transition-metal ions is a very useful general review as well, particularly on the experimental technique side. An extensive review of inorganic and organometallic radicals covers highly interesting topics, which range from F-center-like units in fluid, to helium cations with a snowball structure, to metal atoms and clusters and their hydrocarbon complexes. Electron-spin resonance has provided significant impetus for the advancement of chemical catalysis from an art to a molecular science. The pioneering work on organic radicals at surfaces and in clathrates and molecular-size holes, in semiconductors and polyacetylene films, to name a few, is very well documented. The continuing popularity of electron-spin resonance work on organic radicals in solutions now appears to move toward organic radical cations; here the more elegant work is centered on the simplest model systems. With the increasing sophistication of time-resolved experiments, one can count on future discoveries of a number of simple organic radicals and radical ions which have so far eluded detection.

The major application areas are polymers, spin labeling, metalloproteins, and medicine. In conducting polymers it is shown that the relationships between unpaired spins and conductivity are still not well understood. In addition to efforts for synthesizing new spin-labeled derivatives, spin-label studies on lateral diffusion and lipid–protein interactions remain the major concern of the workers in the field. Along with other experimental techniques, such as fluorescence and X-ray diffraction, electron-spin resonance has currently been employed rather extensively for studies of paramagnetic metalloproteins. In medical applications, radical–iron complexes and biological damage by radiation in tissues continue to be the milestones. It is reasonable to project that in future volumes electron-spin resonance imaging may play a significant role in medicine.

The reviewer echoes the editor's comment that this volume continues to present "unique and comprehensive accounts of recent development in electron spin resonance". It follows that this volume should find a readily available space on the desks of present and future practitioners in the fields.

Jeffrey K. S. Wan, *Queen's University, Canada*

Photochemistry. Volume 16. Senior Reporter D. Bryce-Smith (University of Reading). The Royal Society of Chemistry: London. 1985. xxii + 592 pp. £125.00 (US $225.00). ISBN 0-85186-145-8. (Available from the ACS.)

This series continues to be indispensable to the practicing photochemist. The major areas of photochemistry are summarized a year at a time by a body of Reporters. The Senior Reporter writes an Introduction and Review of the Year as an overview of the most significant work. Streuonus efforts are made to reference all papers published in the period covered, generally in one or a few sentences with structures, diagrams, and tables as appropriate. In Volume 16, about four thousand citations are made, though with some duplication. Part I, Physical Aspects, is divided into chapters on condensed-phase and gas-phase processes. Part II, Inorganic and Organometallic Compounds, covers transition-metal complexes, organometallics, and main group photochemistry. Part III, Organic Aspects, contains seven chapters, organized by type of reactant for the most part; the usual functionalities are included. Parts IV (Polymer Photochemistry) and V (Photochemical Aspects of Solar Energy Conversion) complete the volume.

Only minor changes in format from previous volumes have been made. The chapter on Gas-phase Photoprocesses presents only about half the work discursively, the rest being relegated to tables with but a few words of description. For those who use this Series primarily as a guide to the literature, the change is likely to present little problem.

This reviewer continues to be amazed at the thoroughness of the coverage in general. One can nitpick about its depth but must realize that the inevitable consequences of a more critical approach are limited coverage and/or further publication delays. Volume 16 was issued in December 1985 and covers the literature from July 1983 through June 1984. This time lag, it is hoped, will diminish in the future, as the Senior Reporter notes that Volume 17 et seq. will be printed from camera-ready copy.

The absence of a subject index is made up for in large part by a closely divided and detailed table of contents. There is an author index. These aids make each volume an easy way to keep up with the relatively recent literature. Since from early on the series has retained the same topical organization, it also is an efficient and effective aid in a retrospective literature search.

The entire series belongs on the shelves of libraries at all institutions in which chemical research is carried out. The list price may deter all but diehards from purchasing individual copies, but members of the RSC enjoy a substantial discount.

Richard A. Caldwell, *The University of Texas at Dallas*

Handbook of Aqueous Electrolyte Solutions. By A. L. Horvath (Imperial Chemical Industries). John Wiley & Sons: New York. 1985. 631 pp. $158.00. ISBN 0-470-20214-9.

This is an extremely valuable reference book that should be on the shelves of all academic or industrial libraries. Unfortunately, the very high price will keep it out of most personal libraries. It is the most modern and up-to-date reference to aqueous electrolytes, containing chapters on 18 different electrolyte properties. The chapters, typically, do not contain so much actual data but, rather, a guide to finding the data and a description of how people have treated that kind of data. There are some eccentricities. For example, heat capacities are treated but heats of solution are not. However, it would still be a very good starting point for anyone who was interested in some particular aqueous electrolyte property. The book does not replace the classic works such as Harned and Owen or Robinson and Stokes, since it is not really a critical approach. It commonly presents all or most of the equations that have been proposed to represent a given property but does not really critically compare them. In some cases the sheer wealth of equations given will confuse the unsophisticated reader. The end of chapter "Recommendation" is not always very useful. There are over 100 pp of appendices, which contain an extremely thorough collection of primary and secondary references. A particularly valuable aspect of the reference sections is the very good review of the Soviet literature.

Gordon Atkinson, *University of Oklahoma*

Encyclopedia of Polymer Science and Engineering. Volume 3. Second Edition. Edited by H. F. Mark, N. M. Bikales, G. Overberger, and G. Menges. John Wiley & Sons: New York. 1985. xxiv + 820 pp. ISBN 0-471-88789-7.

This volume, prepared under the direction of J. I. Kroshwitz, contains articles ranging from Cellular Materials to Composites and includes topics such as cellulose and cellulose derivatives, characterization and chemical analysis of polymers, chromatography, coatings, collagen, colloids, and colorants, to name a few. Approximately one-quarter of the volume (pp 60–270) is devoted to 8 separate chapters on cellulose and its derivatives, each with its own separate bibliography.

As in the previous volumes, abbreviations, SI units, conversion factors, and unit symbols are listed in the fore pages. Cross referencing is excellent. The articles are generally written in a style that is clear, concise, and accessible to the layman. Bibliography sections which are provided at the end of each article range from brief listings consisting mainly of general references to what appears to be a more comprehensive compilation of the literature on a given subject. There are numerous tables summarizing properties and uses of various materials, lists of manufacturers, trade names, etc. Figures are generally simple and very clear with a nice balance of scientific and engineering information. In short, contributions in this volume, as in the previous volumes of this series, provide an authoritative source of information as well as references.

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