Book Reviews

Separation and Purification by Crystallization. Edited by Gregory D. Botsaris (Tufts University) and Ken Toyokura (Waseda University). American Chemical Society: Washington, DC. 1997. xii + 299 pp. ISBN 0-8412-3513-9.

Crystallization represents an essential stage in the separation and/or purification of compounds, both in the research laboratory and in large-scale chemical production. Despite the central significance of crystallization and many decades of study, however, our fundamental understanding of the formation and growth of crystals remains incomplete, largely due to the great complexity of what might superficially be considered to be a comparatively simple process.

This volume, a part of the American Chemical Society's Symposium Series (no. 667), stems from a crystallization symposium at the 1995 International Chemical Congress of Pacific Basin Societies. Contributed chapters, covering a wide range of crystallization science and technology, are grouped into five sections, basic studies (four chapters), crystallization of optical isomers and polymorphs (eight chapters), studies related to industrial crystallizers and processes (three chapters), crystallization of particular organic compounds (three chapters), and crystallization of particular inorganic compounds (five chapters). Reported studies range from theoretical analyses of crystal form to optimization of crystallizer performance, broadly spanning the chemical and chemical engineering sciences, and vary from highly empirical reports to detailed analytical studies.

The contributions, which represent a by no means comprehensive but nonetheless quite illustrative accounting of the variety of studies ongoing in the area of crystallization, are somewhat uneven in merit, with some representing cutting edge studies but others appearing to be rehashes of older and well-studied systems. As a symposium proceedings volume, perhaps it is to be expected that a number of studies conclude with uncertainty as to interpretation, but despite the potential utility of the reported data in continuing studies, the inability to draw any firm conclusions is occasionally rather frustrating. More than a few presentation errors in several chapters (e.g., mislabeling of key crystal lattice planes) are distracting, but generally are sufficiently obvious to avoid serious confusion. The technical presentation of the volume is quite high, particularly for a production based on camera-ready contributions. Minor typographic errors are relatively few in number, and references to the primary literature are appropriately comprehensive and up-to-date.

Given the importance of the subject area and the breadth of the coverage in this volume, it represents a significant reference work, and this, when coupled with the high quality of a significant fraction of the contributions, suggests this volume to belong in any comprehensive reference collection.

Kenneth M. Doxsee, *University of Oregon*

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Foundations of Modern Biochemistry, Vol. 2. Quantum Leaps in Biochemistry. Edited by Margery G. Ord and Lloyd A. Stocken (Oxford University). JAI: Greenwich, CT. 1996. x + 257 pp. $112.50. ISBN 0-7623-0077-9.

Scientists frequently complain about the public's ignorance of science and its impact on their daily lives. Yet, scientists themselves are almost universally guilty of a remarkable ignorance of both scientific history and of the basics of scientific disciplines just slightly removed from their own expertise. Thus, when a book comes along that professes to provide personal perspectives on many of the landmark developments in biochemistry, the opportunity to fill in some of those historical gaps in knowledge is wonderfully enticing.

This book is a series of loosely connected reviews intended to provide personal perspectives on the development of some of the major areas of biochemistry. There are chapters covering DNA coding, manipulating DNA, extranuclear DNA, protein synthesis, structural biology, glycobiology, and cell cycles. Most of the book chapters are written in a very personal and engaging style that makes the material very accessible and adds a great deal of charm to the narrative. Given the broadness of the topics, individual chapters could easily have bogged down in a pedantic repetition of chronological events. Fortunately, most of the contributing authors avoid this problem and concentrate on describing developments in the field from a personal perspective. In all but one case, the chapter on glycobiology, this approach is remarkably successful. Unfortunately, the glycobiology chapter reads like a standard review. Given the broadness of the topic, such an approach is virtually guaranteed to give an uneven and somewhat boring treatment of the subject. As a result, there is far too much detail in some areas, and little or none in others. (For example, carbohydrate sulfation does not seem to merit a discussion.) There is no historical or personal perspective here, and the casual reader should simply skip this chapter since a standard biochemistry textbook would provide the uninitiated with a more systematic treatment of the subject.

Since I enjoyed virtually all of the book it might be a bit unfair to single out any sections for particular praise. However, I must confess that I was particularly partial to chapters on the cell cycle and on protein synthesis. In lamenting his appointed task Philip Siekevitz in the chapter on protein synthesis says "The beginning is arbitrary, the ending is unknown; conjecture is rife at the beginning and doubt appears at the ending". If this sounds a bit like the O. J. Simpson trial it certainly conveys the way these monumental stories unfold and the personal perspective these authors can offer. The chapter on structural biology was very enjoyable but surprisingly short, although it did a nice job of covering many of the problems that confronted structural biologists early on. In any case, most of the authors offer a good list of more standard reviews to fill in gaps in the details that were not covered.

Last, some special mention of the chapter on manipulating DNA should be made. Although this chapter lacked some of the personality present in some of the other sections, it more than compensated in terms of clarity of information and attention to important details. Jan Witkowski does a lovely job of summarizing many of the historical elements of the molecular biology revolution, while at the same time presenting the reader with a really nice explanation of how many of these techniques work, and an appreciation of why these developments were so crucial.

The book can be read cover to cover in less than a week of casual perusal, and it makes for pretty decent bedtime reading. The material in this book can also be quite useful in spicing up undergraduate biochemistry lectures. (For example, pictures of the original clay models of hemoglobin are certainly worth showing to an introductory biochemistry class.) I would highly recommend this book to anyone from the graduate level on up who has an interest in a personal perspective on some of the most fundamental developments in the field of biochemistry.

Theodore S. Widlanski, *Indiana University*

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Polymeric Multicomponent Materials: An Introduction. By L. H. Sperling (Lehigh University). Wiley/VCH: New York. 1997. $59.95. xviii + 397 pp. ISBN 0-471-04138-6.

This introduction to polymeric multicomponent materials is a "modern text covering the basics in the field". The text covers polymer blends, blocks, grafts, interpenetrating polymer networks, and composites. It is an excellent teaching vehicle and includes fundamental relationships, polymer surfaces and interfaces, and selected engineering polymeric materials. References are included through 1996. The author concludes with a short chapter on future directions which I would have liked to see expanded. Nevertheless, it is an excellent textbook for teaching this important subject area. In large part, much of our present technological and industrial polymer developments are in these areas

and depend on this knowledge base. The author should be commended for this successful effort.

Eli M. Pearce, *Polytechnic University*

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Advances in Atomic Spectroscopy, Vol. 3. Edited by Joseph Sneddon (McNeese State University, Louisiana). JAI Press, Inc.: Greenwich, CT. 1997. x + 227 pp. $109.50. ISBN 0-7623-0072-8.

As the third in the series, this monograph on atomic spectroscopy comprises one extended and four brief chapters by experts addressing plasma source mass spectrometry (PSMS), graphite furnace atomic absorption spectrophotometry (GFAAS), and direct current arcs and plasma jets.

In the initial chapter (32 pages) on PSMS, A. Fisher and L. Ebdon principally examine inductively coupled plasma (ICP)-MS literature resources, plasma characteristics including interferences, instrumentation, sample introduction techniques, and some applications and isotope analysis. The novice will find this chapter useful for its references and emphasis on selected examples, many of which were published in 1994 or 1995, and perceptive evaluations that highlight practical issues. Experienced ICP-MS readers will agree that this compact chapter only briefly examines modern systems, current theory, and difficult applications. Not a substitute for longer critical articles or books on the topic, this chapter reflects the extensive experience of the authors and is a useful snapshot of a rapidly developing field.

Multielement graphite furnace and flame AAS are featured in the second short chapter (29 pages) by J. Sneddon and K. Farah. Descriptions of research and commercial multielement instrumentation systems are followed by sections on flame and furnace applications in this historical survey through 1994. Potential problems that limit applications of these multielement AAS instruments are described. Readers will find this chapter informative, but as the authors emphasize, further developments remain before the potentials of the techniques are achieved even with commercial systems.

Direct current arcs and plasma jets are described by R. Avni and I. Brenner in an extensive 139-page chapter. They examine fundamental characteristics of atmospheric pressure dc arc discharges, dc plasma jets, and applications of the former. Classical in content, the chapter summarizes the accumulated knowledge of arc properties and applications. These topics have not been updated for more than a decade in other publications. The chapter is well written, and topics are treated with sophistication by the experienced authors. Unfortunately, characteristics and applications of the only commercially successful dc plasma jet are missing, although a significant literature and research base exists. Neither the dc arc nor research plasma jets are in fashion today, but interested readers will find this detailed review of arc developments and selected applications during the past 40 years useful background. For example, the authors connect parallels between arc chemistry with current electrothermal vaporizer systems.

In the final chapter by J. Sneddon (22 pages), an impaction-GFAAS system for the determination of metals in air is described. Theory, instrumentation, and experimental results are presented in this synopsis of research directed by the author during a decade or so. Sufficient information is provided, so that a reader can decide whether an impaction-GFAAS system might be worth developing for some particular application.

Overall the volume does not achieve the "vanguard" article/review status promised by the editor, since the rapidly developing topic (PSMS) can become dated in a few years, and AAS and dc arc spectroscopy are mature areas. The book would have been much more valuable to researchers had it been published a decade ago. Perhaps most useful as a historical library reference, this volume will satisfy only a few readers. Fortunately, relatively few typographical errors were found. For example, Planck's constant is misidentified on page 4. The index covers only the major topics. In summary, this volume will be helpful to a limited readership.

Ramon M. Barnes, *University of Massachusetts*

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Advances in Transition Metal Coordination Chemistry. Volume 1. Series Editor: Chi-Ming Che. Volume Co-Editor: Vivian W. W. Yam (The University of Hong Kong). JAI Press: Greenwich, CT. 1996. xii + 293 pp. $109.50. ISBN 1-55938-335-6.

A new series from JAI Press devoted to transition metal chemistry debuts with an excellent volume largely devoted to systems containing metal−ligand multiple bonds. Five of the six contributions herein adhere to this theme, and practitioners in the area will find much of interest here.

In chapter one, Recent Progress in the Chemistry of Metal-Carbon Triple Bonds, Andreas Mayr and Samyoung Ahn provide a thorough review of the literature covering the period 1990 through mid-1994. This is the largest chapter of the book, comprising 103 pages and 187 references, and it is very well done. Physical and theoretical studies of alkylidyne complexes are summarized first, and three tables provide useful compendia of structurally characterized systems, $\delta(M^{13}CR)$ chemical shifts, and UV/vis data. Methods of forming metal−carbon triple bonds are covered next, and an extensive section on reactions of alkylidyne complexes completes this review. The latter two sections are particularly successful in systematizing a great deal of reactivity.

In chapter two, Formation of Metal-Ligand Multiple Bonds in Redox Reactions, Jim Mayer summarizes his group's extensive studies of multiple bond formation by the $[MCl_2(PR_3)_4]$ complexes of W and Mo, and uses this body of work to provide comparative insight to the general area of redox reactions which form and cleave multiple bonds. The result is a satisfying analysis which provides a unifying thermodynamic, kinetic, and mechanistic interpretation of these reactions.

Electronic structure and excited-state behavior of metal oxo complexes are the focus of the next two chapters. Vincent Miskowski, Harry Gray, and Mike Hopkins provide in-depth coverage of the electronic spectra of L_nMO and L_nMO_2 systems, beginning with an angular overlap model MO picture and proceeding to detailed descriptions of both metal-centered and LMCT transitions. A comprehensive discussion of the spectra of d^2-MO_2L_4 systems concludes the chapter. The excited-state reactivity of the $[ReO_2L_4]^+$ system is highlighted in the contribution from Wentian Liu and Holden Thorp entitled Excited-State Proton Transfer Reactions of Multiply-Bonded Ligands. Drawing on approaches familiar from excited-state electron-transfer studies, a concise presentation summarizing proton-transfer reactions from various donors to excited states of terminal oxo complexes is provided. Taken together, these two chapters reinforce and complement each other admirably.

In chapter five, Chi-Ming Che and Vivian Yam collect and summarize electrochemical studies of high-valent oxo complexes of Ru, Os, and Re. The bulk of the coverage, which is thorough and systematic, deals with proton-coupled multielectron-transfer reactions occurring in aqueous solution; for each element, a short section summarizing pertinent electrochemical studies in nonaqueous media is also provided.

The volume concludes with a contribution from Xiao-Zeng You and Yong Zhang entitled Conducting Metallic Complexes, which provides a broad, introductory-level survey of both charge-transfer salts and low-dimensional coordination polymers displaying electrical conductivity. Although the topic stands apart from the remainder of the book, the contribution does fulfill one of the editor's commendable aims for the series, namely, to heighten awareness of the voluminous research being conducted in China on transition metal systems.

The volume incorporates a subject index, and is generally free from typographical errors. The editor is to be congratulated for attracting a distinguished group of authors who have produced a cohesive and useful addition to the literature on metal−ligand multiple bonds.

Eric A. Maatta, *Kansas State University*

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