Book Reviews

Reviews in Macromolecular Chemistry. Volumes 9–11. By G. B. BUTLER (University of Florida), K. F. O'DRISCOLL (University of Waterloo), and M. SHEN (University of California). Marcel Dekker, Inc., New York, N.Y. Vol. 9: 1973, 369 pp. $23.50. Vol. 10: 1973, 361 pp. $25.50. Vol 11: 1974, 373 pp. $29.50.

These books, as well as others in this series, are exact reproductions in hard cover of articles which have appeared in the periodical *Journal of Macromolecular Science—Reviews in Macromolecular Chemistry*, from the same publisher, although nowhere in the books is it so indicated. Volume 9 is identical in content with Volume C8 of the Journal published in 1972; Volume 10 is identical in content with Volume C9, No. 1, of the Journal published in 1973, and Volume 11 is identical in content with Volume C10, No. 1 and 2, of the Journal published in 1974.

In Volume 9, the review on mathematical modeling is primarily concerned with the calculation of molecular weight distributions in addition and condensation polymerization reactions, based upon rate parameters, and with copolymer composition and sequence distributions. The review on mechanical properties of polymers covers the effect of molecular weight distribution, particularly the presence of high or low molecular weight fractions, on such properties as stress-strain behavior (including yield point and modulus), impact strength, stress cracking and crazing, fatigue and dynamic mechanical behavior, as well as physical properties of the glass transition temperature and melting point. The chapter on anionic cyclopolymerization includes the application of this reaction to the preparation of polymers from nonconjugated dienes, biscarbonyl monomers, diepoxy monomers, dinitriles, and diisocyanates and concludes with a discussion of the mechanism of cyclopolymerization for all types of initiators. Part IV of the series of reviews by Sawada on the thermodynamics of polymerization reviews the possible types of equilibrium polymerization with particular emphasis on vinyl, ring-opening, and aldehyde polymerization reactions and includes discussions on ceiling temperature, floor temperature, molecular weight distribution, and a thermodynamic analysis of equilibrium polymerization. Lastly, the chapter on carbon-13 NMR analysis of polymers is quite timely and covers both the experimental techniques and applications (but with references only up to 1971) on a variety of polymers including polyelectrolytes and cross-linked systems.

In Volume 10, a review by Janacek is primarily concerned with the work of the Prague school on poly(2-hydroxyethyl methacrylate), which has found a number of applications recently and which is also an interesting hydrophilic, cross-linked polymer for studies of topological features and mechanical properties of networks. The latter subject is the principal one of this review. The review on kinetic relationships is concerned with some specific aspects of radical polymerization including the cage effect, primary radical termination and diffusion effects, and activated and complex radical theories. The light scattering review is concerned with the use of lasers for studying translational and rotational diffusion in solutions of synthetic and biological polymers. The review on the acoustic adsorption method includes discussions of the application of this technique to simple liquids, experimental observation of sound wave propagation, and experimental studies on polymer solutions for relaxation measurements. The chapter on GPC interpretations is a valuable discussion of instrumental spreading corrections, calibration of GPC chromatograms, molecular weight measurement of effluents, and concentration effects in quantitative analysis. The longest review in this volume is a valuable compilation of the results of relaxation studies on both single crystals and melt-crystallized bulk samples of a wide variety of synthetic and biological polymers with a strong emphasis, of course, on polyethylene but also including polyoxymethylene, polyamides, polyesters, and a variety of vinyl polymers. Much data and many electron micrographs are included in this excellent interpretive review. The book concludes with two short reviews on the polymerization of isocyanates to nylon-1 type polymers both in solution and the solid state and on the use of positrons to investigate the state of mixing in polyblends, plasticized PVC, and graft copolymers.

In Volume 11, the chapter on surface tension includes a coverage of the method of measurement and the effects of temperature, molecular weight, copolymer composition, and phase transitions on this property as well as a short treatment of interfacial tension between polymers. The review on mixing and polymer reactors emphasizes residence time distribution theory in continuous flow systems with discussions of the effects of micromixing on reaction yields, molecular weight distribution, and copolymer composition distribution. The review on polymer crystallization is primarily concerned with kinetic theories of nucleation, rate terms, lamella thickness, and transport factors applied to the determination of growth rate of crystalline regions. The review on rheooptical methods is a particularly important contribution to this book and covers in detail the use of birefringence, dichroism, X-ray diffraction, small-angle light scattering, and polarization methods for the study of the deformation and flow of polymeric solids and includes experimental techniques, theoretical justification, and interpretation of results. The review on the thermal decomposition of PVC compares the behavior of the polymer with low molecular weight model compounds in order to elucidate the effect of irregular structures on thermal stability of the polymer and to interprete the mechanisms of the reactions involved. The final chapter, another contribution in the series by Sawada, is concerned with the features of copolymerization which are particularly related to the reversibility of this type of reaction and includes discussions of the heat, entropy, and free energy change of copolymerization as each affects the molecular weights obtained and the composition distributions in both binary and multicomponent systems.

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Advances in Chemical Physics. Volumes XXV and XXVI. Edited by I. PRIGOGINE (University of Brussels) and S. A. RICE (University of Chicago). John Wiley & Sons, New York, N.Y. 1974. Vol. XXV: xii + 308 pp. $22.50. Vol. XXVI: xii + 38 pp. $24.95.

This distinguished series of review volumes in chemical physics continues with the present collections. The first of these, Volume XXV, contains four articles: "A Density Matrix, Bloch Equation Description of Infrared and Microwave Transient Phenomena," by J. C. McGurk, T. G. Schmalz, and W. H. Flygare, a theoretical description of the use of infrared and microwave transient phenomena to probe the vibrational and rotational energy levels of molecules; "Classical-Limit Quantum Mechanics and the Theory of Molecular Collisions," by W. H. Miller, a lengthy (109 pp) and exceedingly thorough account of the construction of an internally consistent classical-limit quantum mechanics which in all respects parallels ordinary quantum mechanics and which incorporates at least qualitatively the important quantum effects of interference, tunnelling, and quantization; "Sources of Error and Expected Accuracy in *Ab Initio* One-Electron Operator Properties: The Molecular Dipole Moment," by S. Green, a short article containing tabulations of recently calculated dipole moments for both ground and excited states of diatomic molecules; and "Algebraic Variational Methods in Scattering Theory," by D. G. Truhlar, J. Abdallah, Jr., and R. L. Smith, a review of the application of this important set of methods to both single-channel and multichannel scattering. While this volume should be of considerable interest to many chemical physicists, it should be particularly valuable for those interested in the theoretical description of collision and scattering phenomena, as two-thirds of the volume is devoted to the pair of articles (the second and the fourth) in this area.

The second of these new volumes, Volume XXVI, contains six articles: "Depolarized Light Scattering by Simple Fluids," by W. M. Gelbart, a lengthy (106 pp) analysis in which it is shown that the many competing theories of light scattering by isotropically polarizable particles can be understood as special cases of general classical and/or quantum mechanical descriptions, that certain

qualitative aspects of short-range polarizability distortion and many-body correlations may be extracted from depolarization features, and that other phenomena such as density-dependent Kerr and dielectric behavior or depolarized light scattering near the gas–liquid critical point are intimately related to collision-induced depolarization; "Equilibrium in Stellar Systems," by R. H. Miller, a statistical mechanical treatment of a model of self-gravitating *n*-body systems with emphasis on the existence of equilibrium states; "Enzyme Cascades and Their Control in Blood Plasma," by E. W. Montroll, a review of the analysis of blood coagulation processes in terms of the kinetics of coupled enzymatic reactions; "Bénard Convection," by E. L. Koschmieder, a review of theory and experiments pertaining to the linear theory of convection in single-component systems; "An Overview of Computational Methods for Large Molecules," by J. Hinze, a very useful outline of self-consistent field, configuration interaction, and pseudopotential computational procedures, together with illustrative examples, but not a cataloging of numerical results; and "The Two-Component Bénard Problem," by R. S. Schechter, M. G. Velarde, and J. K. Platten, an article on convection in solutions which nicely complements Koschmieder's article. This volume is overall one of the most interesting in the series, and should serve to acquaint the reader with several of the less familiar but nonetheless important areas of chemical physics.

Lawrence L. Lohr, Jr., *University of Michigan*

The Structures of the Elements. By JERRY DONOHUE (University of Pennsylvania). John Wiley & Sons, New York, N.Y. 1974. xii + 436 pp. $22.50.

This is an elegant, entertaining, and informative book. Donohue, a well-known contributor to the field, has produced a critical compilation of all crystallographic structural data available up to the end of 1972 for the pure elements, including one chapter devoted entirely to the isotopes of hydrogen. For each allotrope, a brief chronological review is given of the available structure determinations, followed by a tabulation of all published sets of unit cell parameters and space groups and, in most cases, an average for each lattice constant, obtained from the most reliable data. One of the principal virtues of the work is the fact that the review of the data is critical; the author provides many useful experimental details in his discussion of each structure and devotes considerable space to clearing up notational ambiguities. Also included are numerous figures depicting structural geometries, phase diagrams, and the temperature dependence of lattice parameters. There is an exhaustive set of references but no index (which is not a shortcoming).

The author has intended his book for an audience of advanced undergraduates and graduate students in crystallography and in the sciences to which crystallography is a useful handmaiden. This is a realistic appraisal of its appeal, but he has assumed some knowledge of crystallography. (It would be helpful, in using this book, previously to have mastered the relevant chapters of, for example, Kittel's solid state text.) Its wealth of detail makes the book of significant value to anyone who needs precise crystallographic information about the elements, although one learns that in fact there are many unresolved difficulties even in such an apparently well-developed field. Even the casual reader will be impressed by the extraordinary diversity of allotropes discovered so far, both well- and ill-characterized. For example, Donohue painstakingly sorts out nearly 50 forms of sulfur, only about 10 of which are crystallographically well defined!

The price of the book will probably put it out of reach of the average graduate student, but it is a significant contribution to the crystallographic literature that will serve both as a valuable reference work and an entertaining stimulus to further research in the crystallography of the elements.

Brian W. Moores, *The George Washington University*

Basic Concepts in Electronic Instrumentation. By CHARLES K. MANN, THOMAS J. VICKERS and WILSON M. GULICK (Florida State University). Harper & Row, New York, N.Y. 1974. vi + 249 pp. $6.95.

This book is a paperback edition of the first nine chapters of the recent instrumental analysis text by the same authors. The selection of topics is similar to that in other introductory electronics texts for nonspecialists. However, this book is about half the length of competing volumes.

There are several serious problems with this text. First, its size limits coverage largely to principles. Design examples using real devices are few. Circuitry discussed is largely the most basic configurations. Discrete transistor amplifiers are discussed at length.

Basic operational amplifier circuitry is presented, but with no mention of the properties of the ubiquitous 741 or any of the other common integrated op amps. Other common integrated circuits, such as timers, comparators, or phase-locked loops are not even mentioned. The chemist these days is likely to start with the linear integrated circuit as the basic analog component. The omissions are serious.

Digital circuitry is briefly discussed in the last chapter. Again, the treatment is limited to the most elementary topics. No reference is made to the properties of real logic families or even to the existence of large-scale integration. Surprisingly, there is no mention of digital data display, although making numbers light up is fascinating as well as useful.

Although the scope of its coverage is inadequate, this book has much merit. The authors are chemists addressing other chemists. They write clearly and without serious errors of fact. They do not assume a background in physics which chemists seldom possess. The sections on basic semiconductor phenomena and small signal equivalent circuits are particularly clear. Because of these strengths the text is useful as supplementary material for students enrolled in courses requiring more rigor than the book provides.

Michael D. Morris, *University of Michigan*

Sulfhydryl and Disulfide Groups of Proteins. By YU. M. TORCHINSKII (Academy of Sciences of the USSR, Moscow). Translated from Russian by H. B. F. Dixon. Plenum Publishing Corp., New York, N.Y. 1974. x + 275 pp. $29.50.

While much of the interest in the disulfide bond has been considered the province of biochemistry, even nonbiochemists are aware of the significance of the S–S linkage in contributing to the secondary and tertiary structures of proteins. However, the sulfhydryl group, despite and, coincidentally, because of its great and diverse reactivity has been equally recognized as essential in a wide variety of biological reactions. The isolation and sequencing by Guillemin and his group of somatostatin, a disulfide bridged cyclic hypothalamic hormone, the contrast between insulin and ribonuclease with respect to reactivation of their reduced sulfhydryl forms, and the still partly mysterious role of glutathione in amino acid transport indicate the breadth and currency of the chemistry of these closely linked functional groups.

Torchinskii has in this volume (from the Studies in Soviet Science Series) surveyed the field admirably, and the fact that well over 10% of the pages of this book contain references attests to the relatively concise nature of this review. This work was completed (Russian Edition) in 1971, but the revised translation includes later references with at least several as recent as 1973.

Workers in this field will recall the monograph by Jocelyn published in 1972; this volume compares favorably with that work [though not in size (lighter) nor in price (heftier)]; it is equally concise (though less encyclopedic) and, as the introduction of this book promises, is "largely complementary" to the Jocelyn text. While this volume contains several errors in words and structures (such as incorrect hormone sequences on page 224), the word "complementary" above is not one of them; the selectivity of coverage vis-à-vis the Jocelyn monograph is perhaps best demonstrated by the authors' nearly complete absence of references to each others works.

The volume is divided into seven chapters and two parts, involving first the chemistry of SH and S–S groups, their quantitative determinations, and the reactivity of SH in proteins. Part II describes the relationships of these groups to peptides and proteins. Included are discussions of sulfhydryl in catalysis and binding as well as methods of identifying the essential SH moieties in enzymes. The greater emphasis on protein sulfur chemistry probably is enough to justify inclusion of this volume in the libraries of workers interested in these macromolecular systems.

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