of structure configurations that can be updated by the user. The portfolio is an integrated archive facility that can be used to store structures and graphics allowing thousands of drawings to be saved in a database-like format. Chemical recognition will allow ChemWindow to import line drawings from other programs and convert them into chemical structures. ChemWindow 3 will also be able to share structure files with SoftShell's ChemIntosh 3 chemical structure drawing program for the Apple Macintosh.

David Gosztola and Michael R. Wasielewski, *Argonne National Laboratory*

*Book Reviews**

Fossil Fuel Combustion: A Source Book. Edited by William Bartok (Energy and Environmental Research Corporation) and Adel F. Sarofim (Massachusetts Institute of Technology). John Wiley & Sons: New York. 1991. 866 pp. $99.95. ISBN 0-471-84779-8.

This is a book of ten chapters and an appendix written by twelve top-flight authors and billed as a "Source Book" on fossil fuel combustion. It is organized into three parts: I. Combustion Chemistry (five chapters); II. Flame Phenomena, Diffusional Processes, and Turbulent Reactive Flow (three chapters); and III. Heterogeneous Combustion (two chapters). The very useful appendix consists of data tables and graphs on fuel and combustion properties, although the publication *Technical Data on Fuel* (now in its seventh edition) is generally more complete.

The first eight chapters are in the realm of combustion science with only the last two dealing with combustion engineering. This shows a little imbalance for a "Source Book". If the timing had been right, this would otherwise have been a good companion to the Palmer/Beer book *Advances in Combustion Technology* (Academic Press, 1976) which better covers combustion engineering and identifies additional topics that one would expect to find in a complete source book on fossil fuel combustion. In addition, significant parts essentially have been taken right out of their own textbooks, notably Strehlow's Chapter 6, Lefebre's Chapter 9, and Smoot's Chapter 10. Consequently, for this and similar reasons, the outstanding question to me is why the book was written at all.

The origin of this book, according to the flyleaf, was that a number of eminent combustion scientists were asked "to conduct a state of the art course on the principles of flame properties". The demand for such information was driven by the increasing scarcity of fuel at that time. While true fifteen years ago, emission constraints appear to be the biggest driver at the moment. Most if not all of the chapters were written between 1980 and 1985, for example, 1981 for Chapters 2 and 3 and 1984 for Chapter 8. The book then has the aura of having been put together as an afterthought. The label "Source Book" in the title appears to reflect more a rhetorical flourish than a meaningful plan. There were later updates before going to press (apparently about 1987 with publication in 1991), but all the chapters suffer somewhat from being five to ten years out-of-date, although some have stood up very well with the passage of time, notably Chapters 2 (by Golden on Thermodynamic and Rate Parameters), 3 (by Dryer on Combustion Chemistry Modelling), and 9 (by Lefebre on Atomization and Spray Combustion).

With these authoritative authors, one does not expect anything but solid, accurate work, and this is essentially what we get. I noted, however, a number of questionable, arguable, debatable, and missing items. What follows is a sampling. On page four of Longwell's opening chapter in Table one, there is a listing of energy consumption through 2000 AD, but the source was Hottel and Howard's book published in 1971. Since that data there has been an oil embargo and two stunning jumps in oil prices followed by the big collapse of the 1980's, all in parallel with development of just about anything that could conceivably generate energy. Was the Hottel and Howard book really the best source and would those authors agree on the predictions today? Two further chapters (Chapter 5 on soot by Haynes and Chapter 7 on diffusion flames by Gerstein) suffer badly from the timing of publication since these chapters have nothing on the developments since the mid-1980's (by Glassman and Wagner amongst others) investigating the inverse diffusion flame (IDF) in which there is a dramatic difference in soot formation between the NDF's and IDF's. Also unmentioned in Chapter 7, presumably for the same timing reason, is the introduction in 1986 of the Species Stream Function that permits tracking of individual species in diffusion flames. William's Chapter 8 does the expected excellent job of defining the nature of the turbulence problem both in terms of the descriptions of the physical models and in the organization of the different flow and reaction regimes with prospects for effective solution of problems of practical value in the future. It still, however, leaves open how to handle today's practical problems of the turbulent jet diffusion flames. Smoot's Chapter 10 presents some major problems, although it is the only one that tries to cover the complete range from science to engineering. It has to be carelessness that my 1981 article in the Chemistry of Coal Utilization (2nd Supplement) written under the auspices of the National Research Council for the Chemistry of Coal Utilization, which he includes as reference 71, is not included in Table 1, Summary of Selected Surveys, since at 150 pages and 565 references with a table of 15 pages of rate data on coal and carbon gas reactions it is the longest review of all. That aside, however, as a matter of more substance, I am at a loss to understand why the empirical *n*-th order rate kinetics is still being advocated (Smoot's eq 23), and none of the fundamental rate equations are even mentioned, although there are 75 years of history from Langmuir, through Hinshelwood and Eyring, to say with equations that the carbon–oxygen reaction is *two* step, not the one step used in the *n*-th order treatment.

To sum this up, as a source book, it is incomplete, particularly in the small coverage of combustion engineering, and it is somewhat uneven in what it does cover. However, for what it does cover, the material is mostly sound, but certainly dated. Although it is mostly available in other texts, it is still a convenience to have so much of the material written by such authorities in one volume. One might say that the book is valuable, but not significant, but that is a position that could now be rectified by a second edition.

Robert H. Essenhigh, *Ohio State University*

Studies in Inorganic Chemistry. Volume 11. Chemistry of the Platinum Group Metals. Recent Developments. Edited by Frank R. Hartley (Cranfield Institute of Technology). Elsevier Science Publishers B.V.: Amsterdam. 1991. 642 pp. $274.50. ISBN 0-444-88189-1.

This series of books presents chemistry of importance and current interest to the members of the chemical community. In this volume the editor notes that while it has been about twenty years since major definitive books on these important metals have been published, specific aspects of their chemistry, such as organometallic chemistry and coordination chemistry, have received attention more recently. Thus, it was not the aim of the book to present a comprehensive coverage of the platinum group metals, but rather to cover recent developments.

Emphasis in the present volume was given to the occurrence and extraction of the metals; to their use in catalysis, electrochemistry, energy, and electronics; to their use in homogeneous catalysis in solutions and melts; to recent developments in our understanding of the chemistry of their coordination compounds which occur in biochemistry; to the use of their coordination compounds in cancer therapy; and to compounds and chemistry of the metals in high oxidation states.

The seventeen chapters in the book were written by twenty-four contributors either from educational institutions or research centers in industry. The contents of the chapters reflect the varied interests of the contributors, but the editor was successful in coordinating the material in such a manner that the pure chemistry and the wide range of applications of the compounds of these metals were skillfully interwoven.

The book begins with a chapter written by the editor (22 pages, 43 references) on the occurrence, extraction, properties, and uses of platinum group metals. There is an enormous amount of useful material on the metals in the chapter, and it will serve as a valuable source for lecturers. The chemistry is limited to extraction processes and some selected uses, since a number of the following chapters are devoted to reactions, chemical preparations of classes of compounds, and the wide variety of applications of the compounds.

Five chapters emphasizing the applications of the platinum group metals follow. These all emphasize catalytic properties and incude a general introduction by G. C. Bond (26 pages, 12 references); a discussion of catalytic combustion by D. L. Tim (14 pages, 28 references); a chapter on the use of these substances for the synthesis of chemicals from synthesis gas by G. R. Steinmetz and J. R. Zoeller (30 pages, more than 301 references); a discussion of the use of these metal catalysts in the petrochemical industry by A. W. Parkins (17 pages, 199 references); and

*Unsigned book reviews are by the Book Review Editor.

an evaluation of platinum group catalysis in melts by J. F. Knifton (22 pages, 47 references).

The chapters emphasizing chemistry include those on C–H bond activation by J. R. Chipperfield (22 pages, 139 references); on oxidation of a variety of organic compounds by E. S. Gore (55 pages, 402 references); on carbonyls of the metals in catalysis by J. A. Davies and C. T. Eagle (30 pages, more than 138 references); and on the use of the metals in the photodecomposition of water by A. Mills (35 pages, 253 references). There are also chapters on homogeneous catalytic chemistry of palladium and platinum by G. K. Anderson (68 pages, more than 408 references) and of rhodium and iridium by F. H. Jardine (62 pages, 511 references). The chemistry of this group of metals in high oxidation states is discussed by W. Levason (69 pages, 443 references). Readers are to be aware that chemical preparations, structures, and reactions constitute this book. Bonding concepts are kept on the pictorial level with Hamiltonians and group theoretical arguments not being used, but in the most minor way, to rationalize chemical trends and reactivity.

There are two excellent chapters on biological aspects of compounds of platinum group compounds: one being devoted to amino-acid and peptide complexes by H. Kozlowski and L. D. Petit (15 pages, 144 references) and the second being devoted to cancer chemotherapy by C. A. McAuliffe, H. I. Sharma, and N. D. Tinker (47 pages, 223 references).

The final chapter on platinum group metals in electronics by P. D. Gurney and R. J. Seymour (26 pages, 135 references) serves to emphasize the multitude of applications of these metals and their compounds. The authors thoughtfully chose only to mention such compounds as KCP and $Ir(CO)_2(acac)$, since these compounds have been discussed in great detail in other current books and reviews.

In conclusion, the book is a storehouse of information on the chemistry of the platinum group metals developed in the 1970's and 1980's. The figures have been carefully chosen, are ample to illustrate the science being presented, and are of high quality. The index is extensive and will guide the reader to the sections of interest. The book will be very useful to workers in laboratories involved in research with platinum group metals and will provide a good introduction to these substances for those who wish to do research with platinum group metals. This book will also appeal to the general reader who would like to keep abreast of research activity in this active field.

William E. Hatfield, *University of North Carolina*

Atomic Spectroscopy. By James W. Robinson (University of Louisiana). Marcel Dekker: New York and Basel. 1990. vi + 299 pp. $99.75. ISBN 0-8247-8311-5.

The successes of the various theories of the structure of the atom and of the nature of the interaction between electrons and photons, accounting for the observed phenomena collectively described under the heading of atomic spectroscopy, form a substantial part of the foundation on which our present day understanding of chemistry is built. Despite the title, this topic is not the subject of Robinson's book. Rather, it is the equally fascinating area of the applications of atomic spectroscopy involving the interaction of valence electrons with UV and visible light for the determination of trace and minor elemental constituents of materials.

Analytical atomic spectrometry is one of the core constituents of modern analytical chemistry and must feature prominently in any course of study relating to the current practice of this branch of chemistry. The author states that the book "should be most useful to the practicing analytical chemist" but adds that "it would also be useful in a university setting as a text for a special topics course".

Professor Robinson was clearly one of the first US analytical chemists to recognize the great potential inherent in the various atomic spectrometries and his early work no doubt contributed to the popularity now enjoyed by most of these techniques. This book does provide interesting insights into the early days of analytical atomic spectrometry in the US, but the inclusion of so much material of a historical nature causes problems with the stated goals of the text.

Any new book dealing with analytical atomic spectrometry faces some formidable competition, as there are already numerous texts dealing with all aspects of analytical atomic spectrometry, with the possible exception of electrothermal atomization atomic absorption spectrometry (ETAAS). Most of the books for the practicing analytical chemist have been written by research active practitioners of long standing in their particular subdiscipline and thus have the edge over the present volume. I would also be reluctant to recommend this text to students because it has such an old-fashioned feel to it. Many recent, and some not so recent, developments are not put in the proper perspective.

Modern analytical atomic spectrometry is such a diverse field that most current practitioners or researchers would consider themselves experts in only their chosen subspecialty, and thus the most successful books in this field have been multiauthor compilations of appropriate chapters. Therefore, any attempt to cover all the various aspects of analytical atomic spectrometry in a book of under 300 pages is almost certainly doomed to failure. This text has many shortcomings, in addition to not reflecting the current state of the art. The chapters are poorly referenced, and the reader interested in obtaining more information would struggle to locate further relevant material. The coverage of the material is also inappropriate for a text appearing in 1990. While there is, quite rightly, a large section devoted to atomic absorption spectrometry (AAS), the amount of space devoted to ETAAS is far too small. More space is devoted to both flame photometry and atomic fluorescence spectrometry (a technique for which, at present, there is no commercial instrumentation available). The author's opening comment on ETAAS ("...atomizers currently available have been a triumph for physics and a disaster for analytical chemistry") represents a highly idiosyncratic view and suggests that the author is either unaware of or has chosen to ignore the many significant advances in instrumentation and developments in chemistry within the graphite furnace that have taken place over the last 15 years or so.

Similar comments might be applied to the chapter on plasma emission spectrometry. It reflects neither the current status of the practice of inductively coupled plasma (ICP) optical emission spectrometry (OES) nor that of ICP mass spectrometry (MS). There is no mention of the current status enjoyed by microwave induced plasma emission spectrometry as the basis for element specific chromatographic detection (for which there is at least one commercially available instrument).

In common with other texts from this publishing house, there is a conspicuous lack of any sort of editorial input with the results that (a) the text suffers from repetition (there is also at least one figure that appears twice), (b) the index is poor, and (c) there are numerous ludicrous typographical errors. Those involving the names of some of the key players are particularly distracting.

Julian F. Tyson, *University of Massachusetts at Amherst*

Phosphorus Chemistry. Developments in American Science. ACS Symposium Series No. 486. Edited by Edward N. Walsh (Consultant), Edward J. Griffith (Monsanto Company), Robert W. Parry (University of Utah), and Louis D. Quin (University of Massachusetts). American Chemical Society: Washington, DC. 1992. xlvii + 286 pp. $79.95. ISBN 0-8412-2213-4.

This book was developed from a symposium sponsored by the Divisions of Inorganic Chemistry and Industrial and Engineering Chemistry, Inc. at the Fourth Chemical Congress of North America (202nd National Meeting of the ACS) held in New York, NY, August 25–30, 1991. It is dedicated to Arthur Dock Fon Toy for his contributions to phosphorus chemistry. A tribute to him is given by H. Harnisch followed by a reminiscence on industrial phosphorus chemistry by the honoree himself. The book contains 20 chapters in typescript form and ends with indexes of authors, their affiliations, and subjects.

Biosensors & Chemical Sensors. Optimizing Performance Through Polymeric Materials. ACS Symposium Series No. 487. Edited by Peter G. Edelman (Ciba Corning Diagnostics Corp.) and Joseph Wang (New Mexico State University). American Chemical Society: Washington, DC. 1992. xii + 332 pp. $79.95. ISBN 0-8412-2218-5.

This book was developed from a symposium sponsored by the Divisions of Polymeric Materials: Science and Engineering and of Analytical Chemistry at the 201st National Meeting of the ACS held in Atlanta, GA, April 14–19, 1991. After a brief Preface by the editors and an overview chapter, the remaining 24 chapters, in typescript form, are organized under the following headings: Permselective Membranes and Immobilization for Enzyme Systems; Electropolymerized Thin Films; Polymer Membranes on Planar Substrates; and Hydration-Dependent Polymer Applications. There are indexes of authors, their affiliations, and subjects.

The Oxford Dictionary for Scientific Writers and Editors. Edited by Alan Isaacs, John Daintith, and Elizabeth Martin, with contributions from M. Barton, R. Cutler, Robert S. Hine, Valerie Illingworth, Anne Moorhead, R. A. Prince, Ruth E. Taylor, Anthony L. Waddell, and J. W. Warren. Clarendon Press: Oxford. 1991. 390 pp. $45.00. ISBN 0-19-853920-7.

In this dictionary, which has the purpose indicated in the title, acknowledgments are given for help and advice to The Department of Zoology, Natural History Museum; The Royal Botanic Gardens, Kew; The Biochemical Society; The International Committee on Taxonomy of Viruses; *Nature*; and the *Journal of Medical Microbiology*. After 372 pages of alphabetical entries, there are Appendices of the following: (1) The electromagnetic spectrum; (2) Graphical symbols used in electronics, Qualifying graphical symbols, Graphical symbols; (3) Letter symbols used in electronics, Use of letter and subscript symbols, Recommended

general subscripts, Recommended general subscripts for parameters; (4) The geological time scale; (5) Mathematical symbols, General symbols, Symbols for functions; (6) The periodic table; (7) SI units, Base SI units, Prefixes used with SI units, Derived SI units with special names; (8) The Greek alphabet; and (9) References.

Polymer Yearbook. Volume 8. Edited by Richard A. Pethrick (University of Strathcylde). Harwood Academic Publishers: Chur and New York. 1991. xi + 412 pp. $250.00. ISBN 3-7186-5154-8.

The avowed purpose of this series of yearbooks is to "gather together information on various aspects of polymer science from all over the world". Volume 8 consists almost entirely of reviews by authors from the former USSR and Japan.

In 146 pages five comprehensive articles by authors from the former USSR deal with the following topics: Influence of Change of Relaxation Properties on Polymer Tensile Strength; Estimating Acidity Strength of Proton Donors in Nontransition Metal Halide Complexes; The Limiting Sizes of the Large Molecules; The Current State and Frontiers for Development of Polymer Ageing and Stabilization; Biodegradable Polymer-Based Dosage Forms: The Physico-Chemical Aspects. The references cover the respective subjects from their origins to their recent developments. The authors draw primarily, but not exclusively, on articles from the former USSR.

In addition to these review articles, the yearbook contains brief reports on two symposia on the ageing of polymers held in the USSR during 1989. A list of 55 selected books on polymers published in Russian in 1989 is also included.

Eighteen compact chapters, which together occupy 114 pages, summarize material presented at meetings held in Japan during 1989. The topics cover a broad spectrum of the polymer field.

Material from world-wide sources frames the sections on the former USSR and Japan. The opening 38 pages of the yearbook contain information about physical properties, synthesis, and applications of selected thermoplastic polymers and copolymers. The volume ends with a compilation of recent dissertation abstracts in polymer science, selections of recent publications and books in the polymer field, and a calendar of meetings scheduled between January 1991 and July 1992.

This book is valuable primarily for chemists interested in keeping up with significant recent research in polymer science carried out in the former USSR and Japan.

Ulrich P. Strauss, *Rutgers University*

Polymer Syntheses. Volume I. Second Edition. By Stanley R. Sandler (Atochem North America, Inc.) and Wolf Karo (Polysciences, Inc.). Academic Press, Inc: San Diego. 1992. $89.95. ISBN 0-12-618511-5.

This volume presents detailed synthetic procedures for several hundred organic and inorganic polymers. Each of the 14 chapters begins with narrative descriptions of a class of polymers and of the methods by which such materials are prepared. Brief descriptions of relevant history and commercial practice are provided. Detailed procedures are then presented much as they would appear in the experimental section of a research article. Appropriate cautions are listed, and new and/or specialized methods are noted and referenced in a concluding section.

The amount of information provided by this volume is extraordinary: more than 1750 literature citations are included. Nevertheless, there are flaws and omissions that detract. Chemical structures are drawn incorrectly on pp 70, 265, 275, and 366 (and perhaps elsewhere), and reaction schemes are misdrawn on pp 112 and 366. In general, the technology used for the representation of chemical structures is archaic and awkward. Significant omissions include the preparation of polyesters by palladium-catalyzed carbonylation, nucleophilic routes to poly(arylene ether ketones), nitro displacement chemistry, and the use of ring-opening polymerization catalysts developed by Crivello and by Inoue. Overall, though, the book is a valuable source of fundamental and practical information regarding methods of polymer synthesis and is recommended for both personal and library purchase.

David A. Tirrell, *University of Massachusetts*

Studies in Physical and Theoretical Chemistry. Volume 75. Molecular Design: Chemical Structure Generation from the Properties of Pure Organic Compounds. By A. L. Horvath (ICI Chemicals and Polymers Ltd.). Elsevier: Amsterdam and New York. 1992. xii + 1490 pp. $295.00. ISBN 0-444-89217-6.

This book documents that various topological, statistical, and structural models can be used to "design" molecules with desired physical, chemical, and pharmaceutical properties. As indicated in the introduction, when a particular combination of properties is desired for some application, one is faced with a daunting list of reported compounds (over 8 million in *Chemical Abstracts*) and a very incomplete list of reported properties of variable accuracy. While no computer program exists which can predict all (or even most) properties of interest, the author hopes that advances in the next few years will allow prediction of such routine properties, enabling the "rational" design of compounds with a desired mix of properties. The aim of this encyclopedic and multidisciplinary volume is to review the many relevant properties of molecules and to indicate how those properties may be derived or estimated from various models.

Chapter 1 gives comprehensive reviews of methods of defining and enumerating molecular structural isomers, of systematically naming them, and of determining their shapes and other characteristics; topological indices, matrix indices, symmetry properties, and related topics are also covered. Chapter 2 reviews states of matter and the variables which influence those properties in about 400 pages. The author is clearly an expert in this area and is impressively comprehensive. Single-value properties such as molecular weight and melting point are discussed, and those properties which become zero at the critical point are noted. Multiple value properties (vapor pressure, density, thermal conductivity, etc.) and numerous thermal and miscellaneous properties are described along with methods of estimating them or relating them to other properties. This chapter concludes with a review of methods of assessing the quality of properties data and a useful listing of available computerized thermodynamic databases.

Chapter 3 explores relationships between structure and properties based on corresponding state theory; topological or structural similarity; group contribution and connectivity index methods; molecular surface area; molecular modeling methods; molecular orbital and molecular mechanics calculations; and various statistical and linear free energy methods, especially as used for "drug design". Chapter 4 reviews models for structure generation; some examples are given of generating structures with desired properties, particularly of potential refrigerant gases. Types of structures appearing in *Chemical Abstracts* are surveyed, and various algorithms for computer representation of structures are described. Chapter 5 attempts to evaluate how well the models work to predict properties; computer aided molecular modeling (CAMM) is reviewed and an example is given involving properties of solvents for carbonless copy papers. Several early molecular modeling programs are reviewed in detail, as well as more recent modeling programs for personal computers. The Appendices list useful references to properties compilations and estimation methods. The book's references alone take up over 300 pages!

While others have covered sub-fields like drug design or polymer properties prediction, this book is remarkably broad in covering a wealth of important properties of various organic molecules; inorganics, biopolymers, and synthetic polymers are less well covered. Perhaps inevitably for a single-author work of such comprehensiveness, coverage is uneven: there is a too detailed discussion of some obsolete computer systems (DENDRAL, CAMSEQ), and some sections are repetitive. The organization is sometimes confusing, but the wealth of useful information can usually be ferreted out with the aid of the 10-page subject index. The whole book was typed, including numerical tables and formulas; a large number of (mostly trivial) typographical errors mar the text. Most of the topics appear to be covered in a reasonably up-to-date fashion: there are many references from 1988–89 and somewhat fewer from 1990.

The book will be valuable for readers needing to understand how various molecular properties are estimated and calculated and for those needing to locate or estimate properties for specific chemicals. It will be useful for providing background on how computer programs work to generate structures and to model properties, but it is not a "how to use" book for such programs. This book has clearly been written over many years by an expert compiler and estimator of molecular properties with wide-ranging interests. It belongs in all research libraries dealing with chemical structures and their properties; I would imagine that the price puts it beyond the reach of most individual scientists.

Peter Gund, *Merck Research Laboratories*