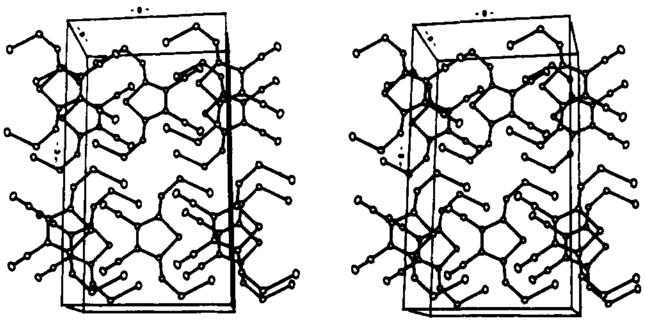

Figure 2. Stereoview of solid-state structure of molecules depicted in Figure 1.

(sulfenyl chloride), it is stable to the atmosphere in the solid state and can be recrystallized from chlorinated solvents but is unstable in solution in polar (e,g., acetonitrile) or Lewis basic (e.g,, THF) solvents, Nucleophiles and reducing agents attack this molecule readily.[10] Reaction paths are complicated; for example, treatment with excess tetrabutylammonium iodide in homogeneous solution affords a conducting (260 Ωcm compaction), black, amorphous solid of empirical formula

$$C_{38}H_{36}N_{18}S_9{=}[(C_{22}N_{17}S_9)^- \cdot (C_4H_9)_4N^+]_n{}^{11}$$

The $(C_4H_9)_4N^+$ ion can be exchanged completely by $TTF^{+\cdot}[TTF_3(BF_4)_2]$ in benzonitrile to produce a solid $[(C_{18}H_4N_8S_8)_n]$ which exhibits a compaction conductivity[10,11] of 19 Ω cm.

The physical, chemical, and solid-state properties of materials derived via condensation and reduction reactions of the title compound are being actively pursued[10] and will be described elsewhere and in future publications.

Acknowledgment. We thank Professor F. A. Davis, Drexel University, for reprints and preprints in the field of sulfenimines and sulfenamides.

Supplementary Material Available: Positional and thermal parameters and temperature factors for **1** (1 page). Ordering information is given on any current masthead page.

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(11) The solid-state ESR spectra of the $(C_4H_9)_4N^+$ and $TTF^{+\cdot}$ salts had *g* values of 2.0025 and 2.0071, respectively.[10]

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Book Reviews

Kirk-Othmer Encyclopedia of Chemical Technology. Volume 6. Edited by M. GRAYSON. Wiley/Interscience, New York. 1979. xxiii + 869 pp. $120.00.

From Chocolate and Cocoa to Coffee, from Chromium to Copper, from Contact Lenses to Contraceptive Drugs, with diversions to Coal, Color, and Computers, this is a fascinating volume. As usual for the series, the articles include some historical background, some economics, a quantity of chemistry that varies according to the subject, and many tables and illustrations. There are 34 entries, which thus average over 20 pages each, contributed by experts drawn largely from American industries. The editing has been thorough, such that the treatment of such pervasive subjects as physical units, chemical nomenclature, structural formulas, etc., is consistent throughout. The quality of both production and content is high.

Aldehydes—Photometric Analysis. Volume 5. Formaldehyde Precursors. By EUGENE SAWICKI and CAROLE R. SAWICKI. Academic Press, London and New York. 1978. xi + 408 pp. £22.00.

A great variety of compounds can give rise to formaldehyde under environmental or biological conditions or in the laboratory. The reactivity of the formaldehyde provides a means for analysis, utilizing one of the several color-forming reactions with such reagents as chromotropic acid (naphthalene-1,8-diol-3,6-disulfonic acid). Terminal olefins, all varieties of *N*-methyl compounds, methyl sulfoxides, etc., are amenable to this sort of determination. This book is a thorough treatment of the subject, covering both established analytical methods and reactions with analytical potential. For each type of substance, a wealth of ancillary information is given, with emphasis on environmental and biological occurrence and significance. Experimental procedures are described, and the reactions involved are elucidated by structural equations. Access to desired information is provided by a detailed index, plus an extensive table of precursor substances with the reagent used to generate formaldehyde from them, and references. The bibliography contains 1537 references.

Advances in Heterocyclic Chemistry. Volume 24. Edited by A. R. KATRITZKY and A. J. BOULTON. Academic Press, New York. 1979. xi + 461 pp. $48.00.

Advancing knowledge has made out of date so many areas of heterocyclic chemistry that were adequately reviewed ten to fifteen years ago, that a major effort is warranted to bring the subjects abreast of current understanding. In this volume, no less than seven subjects of earlier chapters have been brought up to date: Quinazolines (W.J.F. Armaregs); Three-membered Rings with Two Heteroatoms (E. Schmitz); Physicochemical Aspects of Purines (J.H. Lister); Reissert Compounds (F.D. Popp); Pyridazines (M. Tišler and B. Stanovnik); Selenium-Nitrogen Heterocycles (I. Lalezari, A. Shafiee, and M. Yalpani); and Pyrrolizindines (D.J. Robins). There are two chapters on new subjects: Benzo[*c*]cinnolines (J.W. Barton), and 1,4-Thiazines (R.J. Stoodley).

Certain of the contributors have been careful to state the period over which they have reviewed the literature (e.g., "through 1976", "to the middle of 1976", etc.), but others have unfortunately made no mention of this important matter, and one has written "the past 25 years", without stating the year of termination, and another has written the vague description "during or after 1979". One misses a subject index in a work such as this, although it must be conceded that it would have to be fairly large. There is the usual cumulative index of titles of chapters beginning with Volume 1, however. The quality of this volume maintains the high standard of the series, and it continues to be an invaluable reference; the number of references in a chapter approaches 1000 in some cases, and the patent literature has not been neglected.

Organic Electronic Spectral Data. Volume XV. 1973. Edited by J. P. PHILLIPS, D. BATES, H. FEVER, and B. S. THYAGARAJAN. Wiley/Interscience, New York. 1979. xiii + 1194 pp. $55.00.

This series continues vigorously, collecting the enormous amount of new data on the visible and ultraviolet spectra of organic substances. A team of contributors have made the bibliographic searches, and the information has been processed at the University of Louisville to

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* Unsigned book reviews are by the Book Review Editor.

generate the tabular presentation, in which compounds are arranged in formula index order. The data given are solvent, wavelength of maxima, extinction coefficients, and references.

Critical Stability Constants. Volume 3: Other Organic Ligands. By ARTHUR E. MARTELL and ROBERT M. SMITH (Texas A&M University). Plenum Press, New York. 1978. xvi + 495 pp. $49.50.

This book is effectively one big table, as are the previous volumes. In it are given data on the stability of complexes between metals and organic ligands of all types other than amines and amino acids. In most cases, values of log K are given, supplemented in many instances by ΔH and ΔS. The arrangement is by class of ligand (e.g., carboxylic acids, phenols, oximes, etc.), under each member of which are found the data on its complexes with such metal ions as have been reported. Name and formula indexes facilitate location of desired data. (See also the following review.)

Stability Constants of Metal-ion Complexes: Part B, Organic Ligands, By D. D. PERRIN (Australian National University). Pergamon Press, New York and Oxford. 1979. viii + 1263 pp. $150.00.

This book appears under the auspices of the IUPAC Analytical Chemistry Division, and is the second supplement to the original work published in 1964. It covers the literature for the years 1969–1973. Owing to the large amount of material, data for inorganic ligands will be found in a separate volume. As with the Martell and Smith book (adjacent review), equilibrium constants are the primary data given, and arrangement is in the formula index manner. Unlike that work, all types of organic ligands are treated together; that is, there is no subdivision according to structural type. The period of time covered is also different. Compounds are identified by names, which are usually unambiguous and clear, but the lack of structural formulas sometimes leads to confusion (e.g., "isonitrosoacetylacetone").

The most important of comparisons between the two works is that the present volume includes all published values, whereas Martell and Smith have used a set of criteria for selecting the most reliable values. This results in a more compact book, in which it is possible to cover a long span of time, as contrasted to the encyclopedic presentation of a five-year period in the Perrin work. Both books are useful in their own way.

An appreciation of the late Professor Gerold Schwarzenbach appears in the forepages.

Handbook of Analytical Derivatization Reactions. By DANIEL R. KNAPP (Medical University of South Carolina). John Wiley & Sons, New York. 1979. xviii + 741 pp. $34.95.

The author is concerned with identification and determination of organic substances by instrumental methods, particularly the different varieties of chromatography and mass spectrometry, rather than the classical methods involving precipitation and determining melting points. Within that limitation, the book is encyclopedic, and contains a vast but well-organized amount of useful information. Derivatives may be used to increase volatility, to improve stability, resolution from accompanying substances, and detectability, or to alter the fragmentation behavior in mass spectrometry. The intended audience is the users of these analytical methods, and theory is accordingly subordinated to practical matter.

After a short introductory section in which the purposes of derivatization, types of derivatives, and varieties of available apparatus are discussed, the main part of the book takes up in fifteen chapters the kinds of compounds, by functional groups (e.g., alcohols), or class (e.g., drugs). For each of these groups, a few pages of overview is given, followed by presentation of the many sorts of derivatives used for it. This consists of the reagent and reaction, clearly set out in equation form, and a typical experimental procedure, with references, and a short paragraph of comments. In general, critical comparison of various derivatives is not given (and might be difficult to provide, considering the large number of them).

The third part of the book consists of appendices and indexes: composition of brand-name reagents, suppliers of reagents and apparatus (with addresses), an index of derivative types and reagents, an author index, and a general subject index.

The text abounds with acronyms, many of which are convenient for laboratory use but are less justified for use in formal publications (e.g., TMAH for Me_4NOH, TBDMS for t-$BuMe_2Si$–), but fortunately, the author provides a thorough glossary. Abbreviations in the text make reading somewhat rough; they are given without periods, and include "diss" for dissolve and "deriv" for derivative, but the very frequently used word "analysis" is, amusingly, not so treated. There is also some lumpy phrasing that exercises one's conceptual digestion, such as "... to the less background obscured higher mass region ...".

Investigators even peripherally concerned with analysis will find this book to be a work of reference of great usefulness, and laboratories in which organic analysis is a continuing operation will probably want to acquire a captive copy rather than risking their colleague's ire by monopolizing the copy in the central library. This book complements the "Handbook of Derivatives for Chromatography" by Blau and King [*J. Am. Chem. Soc.*, **101**, 6147 (1979)], which is organized about type of derivative rather than type of substrate, and covers a broader field in fewer pages.

Interpretation and Processing of Vibrational Spectra. By M. HORAK and A. VITEK (Inst. Nucl. Res. Rez, Prague, and Ustav. Mol. Genet., CSAV, Prague). John Wiley & Sons, New York. 1979. xii + 402 pp. $46.50.

This text was written as a handbook containing descriptions and methodological hints in procedures for handling and interpreting infrared spectra. It specifically deals with the treatment and analysis of infrared absorption and Raman spectroscopic data obtainable from commercially available equipment using commonly applied techniques. Band spectra of liquids and solutions receive major consideration.

A very brief introduction is followed by the second chapter, Vibrational Spectra. The latter contains a review of the basic principles of the origin and appearance of such spectra. Chapter Three concerns the measurement and handling of the spectroscopic data. It stresses quantative aspects of data reduction in band spectra and clearly reflects the extensive experience of the authors in this area. The next chapter develops group theoretical principles and considers their application together with other techniques to band assignment. A fifth and final chapter outlines the application of the previously described methods to a variety of chemically related problems. Finally, a number of subroutines and program listings together with test data and conversion tables are available in the Appendix.

The text, which is attractively written in a very personnable style, is particularly noteworthy for its large collection of formulas and tables relevant to practical aspects of such spectra. Although an extensive bibliography is included at the end of each chapter, unfortunately relatively few of these references are specifically quoted.

Investigators with commercially available spectrometers applying commonly used vibrational spectroscopic techniques will find this a very helpful reference. Graduate students and technicians in organic and inorganic chemistry and other related disciplines will find it particularly relevant in recording and analyzing vibrational band spectra.

John W. Bevan, *Texas A&M University*

The Chemistry of Silica. By R. K. ILER. John Wiley & Sons, New York. 1979. xxiv + 866 pp. $65.00.

The purpose of "The Chemistry of Silica" is to present a complete and coherent account of the chemistry of amorphous silica, including soluble silica and silicate precursors of soluble silica, polymerization to polysilicic acids, colloidal sols and gels, the surface chemistry of silica, and silica in living organisms.

Chapter 1 describes the occurrence, dissolution, and deposition of silica. Topics include: the silica–water system, soluble silica–monosilicic acid, phases of silica, the solubility of silica, effects of particle size, impurities and organic compounds of solubility, solubility in molten salts, rate of dissolution, removal and deposition of silica from water, and methods of analysis (338 references).

Chapter 2 describes water-soluble silicates. Topics include: sodium and potassium silicates, the nature of silicate solutions, solutions of polysilicates, lithium silicates, organic base silicates, and organic chelates of silicon (216 references).

Chapter 3 describes the polymerization of silica. Topics include: monosilicic acid, characterization of silicic acids, polymerization at pH 2–7 and above pH 7, polymerization by aggregation, and polysilicic acids (205 references).

Chapter 4 describes colloidal silica-concentrated sols. Topics include: growth and stabilization of discrete particles, methods of making and characterizing sols, purification and concentration, aggregation of particles, modified surfaces, and uses of colloidal silicas (769 references).

Chapter 5 describes silica gels and powders. Topics include: silica gels and precipitated powders, physical characterization of gels and powders, hydrophobic-organophilic silica powders, and uses of gels and powders (693 references).

Chapter 6 describes the surface chemistry of silica. Topics include: nature of the silica surface, ionization and surface charge, hydrophobic surfaces, and adsorption of organic polymers on the silica surface (502 references).

Chapter 7 describes silica in biology with emphasis on the chemistry of soluble and colloidal silica in relation to interaction with biochemicals and biocolloids. Topics include: association with primitive organisms, plants, and mammals (414 references).

The book concludes with separate authors and subject indexes.

John M. Powers, *School of Dentistry, University of Michigan*

Brownian Motion and Spin Relaxation. By R. LENK (University of Geneva). Elsevier Scientific Publishing Co., Amsterdam and New York. 1977. x + 250 pp. $44.90.

Theoretical developments in the field of nuclear spin relaxation have not received adequate coverage in monograph form since the appearance of Abragam's excellent book, "The Principles of Nuclear Magnetism", in 1961. Dr. Lenk's monograph is presumably aimed at bridging this gap. The main novelty in his approach is the development of the theory of spin relaxation using concepts of irreversible thermodynamics and nonequilibrium statistical mechanics. Unfortunately, the treatment of many topics covered is too cursory to be useful to the specialist and lacks the organization and lucid development that are required in an introductory text. The theoretical development is particularly weak in the area of Brownian motion, which is discussed essentially in outline form in Chapter 4. Results from random-walk models and from solutions of the Fokker-Planck equation are only peripherally integrated with the subsequent theoretical development of spin relaxation. This is short shrift for a topic that comprises one-half of the titular subject matter. A considerable amount of space is devoted to the derivation of familiar and basic relations pertaining to magnetic relaxation in liquids from the nontraditional starting point of nonequilibrium thermodynamics. For example, the Bloch equations are derived from phenomenological relations of entropy production. Theoretical developments beyond the most basic level are primarily concerned with studies of translational and rotational diffusion in solutions and liquid crystals. A discussion of relaxation and spin thermodynamics in solids would have been very timely considering the current interest in line-narrowing techniques but is excluded from the scope of the text.

Both preface and book jacket stress applications of the subject to biological systems, but, in fact, the applications described concern primarily molecular dynamics in synthetic polymer solutions and liquid crystals. Much of this work reflects the author's research interests and is not particularly illustrative of the preceding theoretical development.

Probably more useful to most readers will be the brief descriptions, with literature references, of a variety of pulsed NMR techniques, such as the pulsed gradient method for measuring slow-flow and diffusion coefficients. However, subjects of broader general interest in chemistry, such as the use of relaxation times to study chemical exchange reactions, information derived from nuclear Overhauser enhancements, and relaxation in paramagnetic solutions, are by-passed almost entirely. This seemingly deliberate exclusion of so many chemically important topics greatly limits the potential audience of the book.

Robert R. Sharp, *University of Michigan*

A Handbook of Decomposition Methods in Analytical Chemistry. By RUDOLF BOCK (University of Mainz). Translated and revised by IAIN L. MARR (University of Aberdeen). John Wiley & Sons, Inc., New York. 1979. xii + 444 pp. 15 × 23 cm. $54.95.

In this day of predominantly instrumental analyses, a vital area to which not much attention has been given is that of sample preparation. Instruments may be designed and checked out on pure solutions, and the key to the use of these instruments is the introduction of a representative sample. Such a sample and proper replicates are best obtained from a solution of the substance of interest. It is precisely for the purpose of preparing samples for analysis that this book will best serve.

As the title indicates, the method of choice for preparing the sample for analysis is that of decomposition. This approach dictates that most of the analyses be for an element, ion, or compound of inorganic nature. Certain organic analyses are covered such as an oxidation with CuO + metallic copper for compounds containing only C, H, O, and N. The elements are converted to CO_2, H_2O, and N_2 which can be measured. Conversion of organic compounds to some other form is exemplified in the measurement of traces of polychlorinated biphenyls which are of interest to environmentalists because of their toxicity. These are usually a complicated mixture of more or less highly chlorinated compounds, and for analysis they are all chlorinated to form decachlorobiphenyl which can be determined by gas chromatography.

A large variety of methods such as simple solution, breakdown by heat alone and by fusion with various fluxes, oxidation reactions, and reduction reactions are covered thoroughly. Especially valuable to those relatively new to analytical work is the section in the first chapter on sources of error. Common but possibly unsuspected losses by volatility at low as well as elevated temperatures, and other types of losses such as gas formation and adsorption to containers are discussed. Further consideration of losses is covered in the individual procedures.

This book would be a useful addition to any laboratory of analytical chemistry. With more emphasis being placed, in recent times, on atmospheric and environmental pollutants, samples containing all kinds of substances must be analyzed. The first step after obtaining a proper representative sample is to get it into suitable form for replicate analyses. For unfamiliar material, this book would be a good starting place in the search for a satisfactory sample preparation procedure.

Taft Y. Toribara, *University of Rochester School of Medicine and Dentistry*

Submolecular Biology and Cancer. Ciba Foundation Symposium 67 (new series) in honor of Albert Szent-Györgyi on the occasion of his 85th birthday. Excerpta Medica, Amsterdam. 1979. ix + 349 pp. $42.50.

This symposium on submolecular biology and cancer was to honor Albert Szent-Györgyi on the occasion of his 85th birthday. In 1941, Szent-Györgyi proposed that conduction in proteins may be responsible for the subtle reactivity and flexibility of the animate. At that time the hypothesis was wholeheartedly rejected, but today an entire symposium has been devoted to those very ideas so rudely rejected in 1941.

The book opens with an introduction by R. J. P. Williams who here briefly introduces the idea of submolecular biology and cancer, through the eyes of Professor Szent-Györgyi. Albert Szent-Györgyi then follows with a brief discussion of the living state and cancer. Here he discusses the idea of "electronic desaturation" as the source of the animate. Following Szent-Györgyi, S. Reslova-Vasilukova and R. J. P. Williams give a very readable discussion on the nature of cancer and tentatively indicate the possible relationship of cancer and submolecular biology. Among the remaining topics are discussions on Energy Bands and Charge Transfer in Proteins by K. Laki, S. Suhai, and J. C. Kertesz; Electronic Structures of Proteins and DNA: Solid-State Aspects by J. J. Ladik; The Mechanism of Conduction in Proteins by T. J. Lewis; Electronic and Dielectric Properties of Protein-Methylglyoxal Complexes by S. Bone and R. Pethig; Free Radicals in Cancer by H. M. Swartz; Whole-Body Nuclear Magnetic Resonance Scanning: NMR Studies of Tumour Cells by R. Damadian, L. Minkoff, and M. Goldsmith; Quantum Chemical Investigations of Charge-Transfer Interactions in Relation to the Electronic Theory of Cancer by C. Thomson and J. R. Ball; The Search for New Cancerostatic Agents by G. Fodor, R. Mujumdar, and J. Butterick; Thermal Copoly(amino acids) as Inhibitors of Glyoxalase I by S. W. Fox, R. M. Syren, and C. R. Windsor; Interactions of Methylglyoxal with Methylamine by S. F. Abdulnur; Methylglyoxal Production in Human Blood by R. B. Brandt and S. A. Siegel; Formation and Properties of Reactive Aldehydes by E. Schauenstein and H. Esterbauer; Biological Activity of Methylglyoxal and Related Aldehydes by M. U. Dianzani; Carcinostatic Activity of Methylglyoxal and Related Substances in Tumour-Bearing Mice by P. J. Conroy; Biochemical Studies of Transient Intermediates in Relation to Chemical Carcinogenesis by T. F. Slater.

The expected readership of this volume will most probably be restricted to specialists in the area, since each of the topics outside of the introductory remarks made by Williams, Reslova-Vasilukova and Szent-Györgyi tends to be of a specialized nature.

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