

Book Reviews *

Air Monitoring by Spectroscopic Techniques. Edited by Markus W. Sigrist (ETH, Zurich). Wiley Interscience: New York. 1994. xxviii + 532 pp. \$85.00. ISBN 0-471-55875-3.

This volume is part of the Wiley Interscience continuing series on Chemical Analysis. The first chapter (Sigrist) provides a brief introduction to the relationship between atmospheric trace gases and environmental issues. The sensitivity and selectivity of various spectroscopic and nonspectroscopic techniques are discussed. The book presents a discussion of those spectroscopic techniques with broader applicability and good sensitivity. Each article in the book presents a detailed description of the theory and background, the experimental approach, and the research applications of the techniques, with numerous up-to-date references. The individual or individuals writing each chapter played a key role in bringing these measurement techniques to a more practical level.

Platt presents a discussion of differential optical absorption spectroscopy (DOAS) (57 pp, 130 references). He does not, however, discuss the commercial version of the instrument or the application of the technique in more routine monitoring situations. Svanberg treats the field of differential absorption lidar (DIAL) (76 pp, 163 references). This chapter presents a very wide range of applications, not limited to atmospheric monitoring. Sigrist discusses laser photoacoustic spectroscopy (PAS) (75 pp, 197 references). Recent results are presented that demonstrate the capability of the technique to measure multiple compounds in the air in a rural area. Schiff et al. review the area of tunable diode laser absorption spectroscopy (TDLAS) (94 pp, 224 references). The results of several intercomparisons are presented between DOAS and other measurement techniques. Hanst and Hanst discuss the long history of work that deals with a variety of infrared absorption spectroscopic techniques, including long-path Fourier transform infrared (FTIR) spectroscopy, as well as nondispersive infrared techniques (135 pp, 65 references). Griffith presents a discussion of matrix isolation spectroscopic techniques, including matrix isolation FTIR, for use with stable molecules and electron spin resonance techniques, for the measurement of radical species (43 pp, 84 references).

The enactment of the 1990 Clean Air Act Amendments has resulted in increased requirements for ambient air monitoring. Some of these requirements may be met by the use of the optical measurement techniques. This book provides a valuable reference for those interested in understanding the fundamentals of these monitoring techniques, and a clear discussion of their capabilities and limitations. Interest has increased in remote sensing techniques and open-path or path average measurement techniques. The book does not deal with the new problems associated with the use of these data, such as comparison with point measurements and the calibration of these techniques, but does deal with the fundamental spectroscopy.

Larry G. Anderson, *University of Colorado at Denver*

JA945002W

Practical HPLC Methodology and Applications. By Brian A. Bidlingmeyer. J. Wiley and Sons: New York. 1992. x + 452 pp. ISBN 0-471-57246-2.

While there are numerous books on HPLC, this one fills a unique niche. It is an excellent text for workers starting out in HPLC and one that they will continue to refer to on a regular basis. The book reads very well. It is written in a narrative fashion, making the reader feel as though he is conversing with an experienced chromatographer who is giving advice on how to get started with the technique. Included in the text are a number of examples of the use of HPLC to solve a variety of problems. In fact (and probably unique to this book), a whole chapter is devoted to the history of HPLC and the way in which it has made an impact on or facilitated discoveries in different areas, including

environmental research, biotechnology, and organic synthesis. The book is not overly theoretical. The important questions are described in detail, and the meanings of the different terms are described in a very practical manner.

The first chapter introduces the most basic concepts of chromatography and briefly surveys some general areas of application. Only one equation is introduced in this chapter. A glossary of terms is provided at the end of the chapter so that the inexperienced chromatographer can easily consult them while reading the text. In Chapter 2, the author gives the novice a better idea of how LC can actually be applied by giving examples from the literature in which LC methodology has made a significant impact in the biotechnology industry, environmental research, polymer research, organic synthesis, therapeutic drug monitoring, and quality control. A more experienced chromatographer might expect this to be the last chapter in a book on HPLC. However, early presentation of these examples allows someone less familiar with the technique to become immediately aware of its wide variety of applications. It helps put the remaining chapters in perspective for the reader.

Chapter 3, which is concerned with the actual instrumentation, focuses on isocratic separations. There is not only a description of how things work but also advice on troubleshooting and potential problems. There is not much information on detection methods in this book. It is presumed that the investigator will know the physical properties of the analyte and thus be able to determine the best detection method. In this chapter some theory is introduced. This is accomplished in a very clear manner, and the relevance of the equations to the quality of the separation is made clear. It is in this chapter that the different modes of chromatography are explained, including normal and reverse phase, ion exchange, and normal phase chromatography.

In Chapter 4, a general strategy for the design of an HPLC separation is presented. This is a good chapter, which starts with the question *What is your job?* In other words, the author makes it clear that when developing a strategy one needs to take into account the complexity of the sample, the number of components that need to be separated and/or quantitated, and whether this is a one-time analysis or one that will be used on a routine basis. This chapter is fairly short but sets the tone for Chapter 5, in which the author gets into the actual nuts and bolts of separating compounds. It gives a good overview of the types of stationary phases available and some general information on what kinds of mobile phases should be used. More specific details on mobile phase selection and preparation are given in Chapter 6. In this chapter, some basic considerations concerning proper operation of a liquid chromatograph are discussed. Some general advice about column selection is given; for example, the variability that one may see in reverse phase columns from different manufacturers is discussed. Some introductory statistics are also included. There is an excellent section on solid phase extraction. There are several useful tables in this section, in addition to practical advice from the author on optimizing a separation.

Chapter 7 concerns gradient elution. This is described in terms of three basic separation situations: (1) early components bunched and late components bunched, (2) early components bunched and late components resolved, and (3) early components resolved and late components resolved. The author describes in detail how to approach each of these situations and discusses many of the practical considerations involved with gradient separations.

The remaining chapters consist of 10 different experiments that can be performed to obtain a better understanding of the chromatographic process. These experiments are well thought out and would be useful for anyone teaching a separations course that involves a laboratory course.

Overall, this is a well-written book with a lot of practical information that will assist the novice chromatographer. It contains many valuable tables of information that can be used for reference, as well as numerous

*Unsigned book reviews are by the Book Review Editor.

examples of successful separation strategies. I recommend it to any one who is just starting out in HPLC or who supervises individuals using HPLC.

Susan M. Lunte, *University of Kansas*

JA934602C

Three-Dimensional Chemical Similarity Searching. By Catherine Pepperrell (University of Sheffield). J. Wiley and Sons/Research Studies Press: New York. 1994. xvi + 304 pp. \$89.95. ISBN 0-471-94238-3.

As the three-dimensional structures of molecules become more available, it is inevitable that interest in three-dimensional similarity searching will increase. This work attempts to develop ways of three-dimensional searching that are both fast and precise. Pepperrell presents an excellent analysis of the strengths and limitations of four methods: atom mapping, distance distribution, individual distances method, and maximum common substructure. The atom mapping method receives the greatest emphasis and receives the most favorable assessment. Abundant illustrations and an extensive appendix give examples of searches, and the writing style is more than adequate. The bibliography is extensive but has few entries past 1990. A fine addition to the series, it is recommended for organic chemists and chemical information specialists, especially those interested in similarity matching.

Margaret Manion, *University of Massachusetts Lowell*

JA945004G

Biological Applications of Photochemical Switches. Bioorganic Photochemistry Series. Volume 2. Edited by H. Morrison (Purdue University). John Wiley & Sons: New York. 1993. xii + 316 pp. \$59.95. ISBN 0-471-57293-4.

This is an extension of the first volume which appeared in print in 1990, edited by H. Morrison. Like the earlier volume, the present one consists of five chapters contributed by 12 authors from Europe and the U.S. The theme of this volume is photochemical switches, written by experts in the field. The book has been printed with one color plate, unlike most hurriedly put together camera-ready copies that appear in the market frequently.

The chapters are well referenced with lots of reviews for those who want more. There are enough diagrams for those who want a quick glance and plenty of details. As one would expect, much of the book is about crown ethers, azobenzene, and spiropyrans. It is enjoyable reading to find out how cleverly these systems, whose basic chemistry has been the subject of investigations for several decades, have been utilized in a number of interesting phenomena. However, the last chapter does not contain any of these familiar molecules. A unique feature of this book is that all the chapters are thorough and critical and cover the work of authors as well as others in the field with little bias.

A very informative Chapter 1 by I. Wilner and B. Wilner is a broad overview of photobiological switches. Occupying one-third of the book, this chapter overlaps with almost all chapters and serves as a general introduction. A thorough and critical Chapter 2 by D. O'Brien and D. Tirrell presents a summary of the use of azo compounds and other unsaturated systems in controlling membrane transport. Photopolymerization and photodestruction of membranes are also covered. A short and interesting Chapter 3 by J. Winkler, K. Deshayes, and B. Shao provides a brief introduction to light-mediated ion transport. Both crown ether and non-crown ether systems are described. Chapter 4 by

N. Porter, J. D. Bruhnke, and P. Koenigs is an elegant introduction to light regulation of enzyme activity. Photoisomerization and photocyclization play an important role in these studies. The last Chapter by J. Corrie and D. Trentham describes research less familiar to photochemists, who would, therefore, benefit much from this chapter. Synthesis, photophysical properties, and the use of a number of caged compounds are described.

In summary, this book is very readable and informative and can serve as a resource for those who wish to expand their territory. Also, this book can serve as supplementary reading for a graduate course in photochemistry and photobiology.

V. Ramamurthy, *Tulane University*

JA934793J

Container Molecules and Their Guests. By Donald J. Cram and Jane M. Cram (University of California). Royal Society of Chemistry: Cambridge, U.K. 1994. xiv + 224 pp. £49.50. ISBN 0-85186-972-6.

The arrangement of topics covered in the book is in a logical order to give the reader historical background and insight into the realm of host-guest chemistry as told by one of the preeminent scientists in the field. In utilizing past and current literature citations, the authors accurately chronicle their immense efforts and those of several other contributors to describe topics ranging from the conceptual genesis of host-guest chemistry to the state-of-the-art developments. The first half of the book (Chapters 1-4) describes the relatively simple cyclic synthetic receptor molecules such as crown ethers and spherands, while Chapters 5-9 progress to the more sophisticated concaved cavitands, spherical carcerands, and hemicarcerands. Numerous X-ray crystal structures of hosts and complexes as well as tables of experimental data make this book a valuable reference source and serve to clearly illustrate the important concepts of host reorganization and preorganization, recognition, and the principle of complementarity.

This monograph is pertinent not only to those chemists working in the field but also to those in biochemistry, physical organic, polymer, catalysis and others in which the study and understanding of nonbonded interactions are important. The book also describes the motivational and inspirational forces associated with all scientific study and how these factors lead from design to discovery of new ideas in science.

Michael T. Blanda, *Southwest Texas State University*

JA945096+

Polymer Science and Engineering: The Shifting Research Frontiers. Edited by Richard S. Stein (University of Massachusetts at Amherst). The National Academy of Sciences: Washington, DC. 1994. x + 180 pp. \$34.95. ISBN 0-309-04998-9.

Polymers are used in products from nylon stockings to commercial aircraft to artificial heart valves and play a key role in international competitiveness. This volume describes polymers' properties and potential and presents the state of the science with a look at downward trends in research support. An overview of polymers in medicine, biotechnology, information, communication, construction, energy, transportation, national defense, and the environment is included. The contents include A Summary and Recommendations, National Issues, Advanced Technology Applications, Manufacturing: Materials and Processing, Enabling Science, an appendix, and an index.

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