

Book Reviews

Circular Dichroism. Principles and Applications, Second Edition. Edited by Nina Berova, Koji Nakanishi, and Robert W. Woody. Wiley-VCH Publishers, New York. 2000. xix + 877 pp. 18.5 × 26 cm. ISBN 0 47133003 5. \$195.00.

This is a very welcome second edition of a seminal book in the area of chiroptical phenomena and the theory, measurement, and application of spectroscopic techniques, particularly circular dichroism. Most of the major experts in the field are represented in this comprehensive treatise on the subject. There are 29 chapters in the book, including 9 which are completely new, while the other 20 have been extensively revised and updated. References through 1999–2000 are cited.

The first chapter is an excellent introduction to circular dichroism and is an edited (by Robert Woody) version of work begun by Gunther Sznatzke before his untimely death. Other chapters range from historical/philosophical (Chapter 2, "From Pasteur to Parity Nonconservation: Theories of the Origin of Molecular Chirality" by Stephen Mason) to complex chapters on theoretical approaches with abundant classical and quantum treatments. There is a wide breadth of subject matter covered, with chapters on organic, inorganic, and biological molecules including proteins and nucleic acids. In addition, different states such as cholesteric mesophases, polymers, solid-state CD, and oriented molecules are discussed in depth.

The book is particularly useful for synthetic and medicinal chemists who want information on chirality and in particular on how to characterize chiral molecules, infer relative and absolute stereochemistry, and investigate the interactions and conformational aspects of chiral molecules. There are chapters on exciton chirality applications (Berova and Nakanishi), the octant rule (Lightner), the benzene sector and chirality rules and applications (Smith), theoretical determination of the absolute stereochemistry of natural products and chiral synthetic organic compounds (Harada), the determination of conformations and absolute configurations by semiempirical calculation of CD spectra (Sandstrom), DNA–drug interactions (Ardbhanmer, Kurucsev, and Norden), peptide and protein conformation using vibrational circular dichroism (Keiderling), CD of protein–nucleic acid interactions (Gray), and applications of chiroptical spectroscopy in the pharmaceutical industry (Brittain).

I wholeheartedly recommend this book to all who are interested in chirality. For medicinal and synthetic chemists working with chiral substances, as most are, this is a very useful reference book. For those who

cannot afford a personal copy: I would encourage you to lobby for a copy for your university or R&D library.

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Natural Extracts Using Supercritical Carbon Dioxide. By Mamata Mukhopadhyay. CRC Press, Boca Raton, FL. 2000. 319 pp. 16 × 24 cm. ISBN 0-8493-0819-4. \$99.95.

Supercritical carbon dioxide has been accepted as an environmentally friendly solvent which avoids the defects caused by industrial processes that rely upon toxic organic solvents such as acetone, methanol, benzene, and chloroform. While ordinary carbon dioxide is apolar, benign, and plentiful, it is also a gas. However, under high pressures (1070 psi) and modest temperatures (310 °C), carbon dioxide reaches its supercritical point and becomes dense like a liquid, yet it maintains its gaslike ability to flow with almost no viscosity or surface tension. Supercritical CO₂ is nontoxic, is nonpolluting, evaporates instantly once the pressure is released leaving almost no trace behind, and is inexpensive. These features make it ideal for industrial processing in decaffeination of coffee and denicotinization of tobacco and for the preparation of natural extracts in concentrated form, free from any residual solvents, contaminants, or artifacts.

Synthesizing research from a wide variety of sources, *Natural Extracts Using Supercritical Carbon Dioxide* reviews recent developments in the technology and its applications to the food, flavor, fragrance, pesticide, and pharmaceutical industries. The book outlines many advantages of the technique over more traditional processes such as steam distillation, solvent extraction, and molecular distillation. The book contains eleven chapters and three appendices. In the first three chapters, the author meticulously introduces the reader to supercritical carbon dioxide technology. The writing style and the detailed explanations make for excellent reading even for scientists who are not familiar with the field but who wish to try the technique. The next four chapters are devoted to application of the technology to flavor and fragrance and fruit, spice, and herbal extracts. The remaining chapters address natural antioxidants, natural food colors, plant and animal lipids, and natural pesticides. This book is more comprehensive than most volumes on this technology. Each chapter contains additional reference materials for further detailed information. However, in the discussion of commerce in herbal extracts, the rate of growth in the Indian herbal industry should have been given in dollars and/or dollar equivalents, as has been maintained in the

other parts of the volume. Some errors and omissions were noted. Pyrrolizidine alkaloids are described as "well known for their anticancerous activity", even though these are recognized as carcinogens. In selected cases details such as common and botanical names, bioactive constituents, and uses of medicinal and some other plants are given. However, for several others there is a lack of information concerning the application of supercritical CO₂ extraction technique for isolation of bioactive constituents.

Nevertheless, this treatise provides essential information for scientists interested in extractions in the laboratory or on an industrial scale, using an environmentally friendly option. The book lays the foundation for the potential investigator in the efficient isolation of naturally occurring compounds. This method of extraction will almost certainly play an even greater role in future natural product discovery, development, and marketing. This book will be of interest to those, inter alia, in food science, dietary supplements, herbal remedies, and pharmaceuticals, who are attempting to diversify into new products or who are seeking an improved process to circumvent conventional separation techniques.

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Practical Process Research & Development. By Neal G. Anderson. Academic Press, San Diego, CA. 2000. xxiii + 354 pp. 15.5 × 24 cm. ISBN 0-12-059475-7. \$89.95.

The topic of organic process research and development has become increasingly visible in recent years. A new journal is devoted to its coverage, symposia and conferences abound, and several books on the subject have recently appeared. Add to this list Neal Anderson's excellent *Practical Process Research & Development*. Written, as the title suggests, from the practical perspective, the book seeks to educate the laboratory organic chemist in both the basics and nuances of conducting organic synthesis on large scale.

Following enthusiastic Forwards by Barry Sharpless and Jerry Moniot, each chapter of the book addresses commonly encountered aspects of large-scale synthesis. Drawing extensively from literature case studies for illustration, Anderson also sprinkles useful tips throughout the text, while his use of lists, tables, and charts aids in reinforcing key concepts. The range of topics is a curious but effective amalgam of broad-based and specific issues and roughly follows the chronology of conducting a synthetic reaction. Thus, the early chapters deal broadly with issues of adapting lab operations to scale-up: route, solvent and reagent selection, and reaction execution. Two shorter chapters on the effects of water on a reaction and in-process monitoring are followed by a pair of chapters on reaction optimization. Chapters on reaction workup and product purification are followed by a chapter on control of product crystal form. Three chapters largely devoted to plant operations then follow. A brief final chapter on chiral synthesis seems strangely out of place.

The text readily succeeds as a highly practical tour through the considerations of chemical scale-up. The somewhat dry writing style is more than offset by the richness in the depth and breadth of topic coverage. Nevertheless, future editions will benefit from expanded discussion on the topics of chiral synthesis and biotransformations on scale, as well as the use of parallel synthesis for rapid optimization.

Newly minted chemists will find this a valuable introductory text, while veteran researchers will also glean much from Anderson's extensive experience. The book can easily be recommended as reading for a graduate organic synthesis course. Medicinal chemists may find this trove of practical synthetic know-how quite useful in their drug discovery programs. Certainly all readers will better appreciate the challenges faced by process chemists in bringing a compound through development and commercialization.

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