Book Reviews[*]

The Chemistry of Functional Groups, Vol. 4: The Chemistry of Organophosphorus Compounds. Edited by F. R. Hartley (Cranfield University). John Wiley & Sons, Inc. New York, NY. 1996. xiv + 945 pp. 15 × 22.5 cm. $375.00. ISBN 0-471-95706-2.

Among the numerous functional groups based on phosphorus, the various acidic ones are perhaps the most common and well-known, and it is fitting that an entire volume in the treatment of organophosphorus chemistry by F. R. Hartley for the Patai functional group series be devoted to this subject. The heart of this volume is the treatment of the four-coordinate phosphonic and phosphinic ($R_2P(O)OH$) acids by Ronald Edmundson. This enormous area is handled skillfully by dividing the subject into five chapters. Together they constitute 60% of the book. The first of the chapters presents syntheses of parent acids without other functional groups. The next two chapters deal with additionally functionalized acids. Acids where sulfur or (to a lesser extent) selenium replaces one or more oxygen atoms on phosphorus are covered in the fourth chapter. The final chapter is concerned with chemical and physical properties of phosphonic and phosphinic acids. Many chemists are currently very active in developing biological applications of these acids, and they especially will find this volume to be of great value.

Because of their special importance, acyl phosphonates are treated separately by Eli Breuer, again in masterful style. This section also is of considerable size (78 pages), reflecting the degree of interest, past and contemporary, in these reactive compounds.

The POH function does not exist when phosphorus is in a lower oxidation state; rearrangement to the PH(O) group occurs. Phosphonous acids ($RP(OH)_2$) and phosphinous acids (R_2POH) are consequently known only in the form of three-coordinate derivatives with halo, amino, or alkoxy substituents. The chemistry of these highly reactive and useful derivatives is discussed in a rather compact chapter by O. Dahl. The chemistry of the well-known H-phosphinic acids (tautomeric forms of phosphonous acids) receives little attention in this chapter; mention is made of them in various places in other chapters, but a coherent discussion is lacking in this book.

Natural products chemists should especially be interested in the biological occurrence of phosphonic and phosphinic acids. While there is a chapter entitled "Biological activity of phosphonic and phosphinic acids" by A. Kalir and H. H. Kalir, the treatment of their occurrence in Nature is quite brief. A few additional references to this interesting aspect of organophosphorus chemistry may, however, be found in other places in the book. This chapter is of greater value in illustrating the rapidly growing area of biological applications of phosphorus acids, both in medicine and in agriculture, although the coverage is not complete. A few incorrect structural formulas were noted in this chapter.

Although known for over 50 years, the highly toxic properties of a few phosphonic acid derivatives had not been put to use against humans until quite recently, but cases are now known where this odious offense has taken place. It is extremely timely, therefore, that an excellent chapter is included on the chemistry of organophosphorus chemical warfare agents by R. M. Black and J. M. Harrison. Numerous aspects of this important topic are discussed and should be read by all chemists wishing a better understanding of this subject.

Rather out of place in this volume is a chapter dealing with aspects of mass spectrometry of organophosphorus compounds in general. Many functional groups are included, but phosphorus acids receive no special emphasis. Nevertheless, the chapter is of value in providing an up-to-date view of the application of MS techniques in phosphorus chemistry. More valuable to the volume would have been an in-depth treatment of NMR spectroscopy of organophosphorus acids. This highly important subject is not handled in a coherent fashion. This does not detract from an otherwise fine, and highly recommended, addition to the literature of phosphorus chemistry.

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Advanced Practical Organic Chemistry, 2nd Edition. By J. Leonard, B. Lygo, and G. Procter (University of Salford). Blackie Academic and Professional, London. 1995. xii + 298 pp. 16 × 23.5 cm. $34.95. ISBN 0-7514-0200-1.

This concise book is written primarily for advanced undergraduate, graduate, and industrial organic chemists. It should also be of value to a much wider audience of practicing organic chemists. The book consists of 17 short chapters, six appendices, and an index. It is well presented and covers many aspects of practical organic chemistry hard to find in any other single text devoted to this subject. Contents of some of the important chapters are reviewed here.

Chapter 2 covers safety, the prime responsibility of a laboratory worker. It lists common hazards in a chemical laboratory, explosion hazards, and toxic and carcinogenic compounds. Keeping records of laboratory work, which in my opinion is one area not taken seriously by many present day researchers, is the subject of Chapter 3. It offers several formats for record keeping and some tips on report and thesis preparation that should be of value to graduate students and

[*]Unsigned book reviews are by the Book Review Editor.

postdoctoral researchers. Chapter 5 covers purification and drying of some commonly used organic solvents, whereas Chapter 6 discusses preparation, purification, and handling of a variety of reagents. The latter chapter includes preparation and titration of simple organometallic reagents and diazomethane.

Chapter 9, which is the longest chapter (48 pp) of this book, is entitled "Carrying Out the Reactions" and discusses the reactions involving air- and moisture-sensitive reagents, low- and high-temperature reactions, and reaction monitoring. This is followed by a chapter on "Working up the Reaction," covering quenching of a reaction and isolation of the crude product. In Chapter 11, commonly used purification methods such as crystallization, distillation, sublimation, and chromatography (flash, preparative TLC, MPLC, preparative HPLC, etc.) are presented. This is followed by two chapters covering special techniques applicable to small- and large-scale reactions. Chapter 14 is dedicated to special procedures including catalytic hydrogenation, photolysis, ozonolysis, flash vacuum pyrolysis, and liquid ammonia reactions. A brief chapter on characterization covers the application of spectroscopic (NMR, IR, UV, MS) and other (mp, bp, $[\alpha]_D$, microanalysis) techniques for the characterization of synthetic organic compounds, as well as how to keep these data. Another important chapter is the one on the chemical literature, which explains how to find chemical information and some important paper-based and electronic-based sources of chemical information. Other chapters include those on gases, vacuum pumps, and trouble shooting.

Six appendices are provided at the end of the book in the form of tables covering properties of common solvents and common gases; approximate pK_a values for some common deprotonations compared to some common bases, lists of Lewis acids along with solvents compatible with them; common reducing agents along with typical solvents, temperature and functional groups reduced; and a similar table for common oxidizing agents.

Overall, this book has a great deal of merit as it emphasizes the most up-to-date techniques commonly used in an organic chemistry laboratory. Thus, it will be of value to all those practicing synthetic organic chemistry. Considering the affordable price tag, this reviewer recommends this book to all advanced undergraduate students, graduate students, and academic and industrial postdoctoral workers.

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Stable Carbocation Chemistry. Edited by G. K. Surya Prakash (University of Southern California, Los Angeles) and Paul v. R. Schleyer (University of Erlangen−Nürnberg). John Wiley and Sons, Inc., New York. 1997. xvi + 587 pp. 15.5 × 23.5 cm. $79.95. ISBN 0-471-59462-8.

This book, dedicated to Professor George Olah, contains 17 chapters written by experts in carbocation chemistry. The book had its origin in a Loker Hydrocarbon Research Institute Symposium in 1992 on the occasion of George Olah's 65th birthday, and the first chapter is a personal retrospective by Dr. Olah of his search for long-lived carbocations. The remaining chapters present various aspects of carbocation chemistry, ranging from physical studies of carbocations by CPMAS NMR or infrared spectroscopy to studies of carbocation rearrangements. Of particular interest to natural product scientists is a short (25 pp) chapter on "Natural Product Chemistry in Superacids" by Jean-Claude Jacquesy.

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Phthalocyanines: Properties and Applications, Vol. 4. Edited by C. C. Leznoff and A. B. P. Lever (York University, Canada). VCH Publishers, Inc., New York, NY. 1996. vi + 524 pp. 15.5 × 23 cm. $150.00. ISBN 1-56081-916-2.

This book contains 13 chapters covering synthetic aspects of phthalocyanine chemistry (five chapters), fundamental work on acid−base reactions and molecular orbital analysis (two chapters), medical and biological aspects of metallophthalocyanine chemistry (three chapters), and applications of metallophthalocyanines in molecular electronics (three chapters).

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