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Book Reviews

Topics in Phosphorus Chemistry. Vol. 11. M. Grayson and E. J. Griffith, Eds. Wiley, New York. 1983. $85.00.

The first chapter by J. Feder is a short (13 pages), noncritical review designed to provide sufficient structural and chemical information on ATP for the reader to better understand its biochemistry. The author accomplishes his aim, although in this reviewer's opinion a nonspecialist in this area would benefit from additional reaction schemes and a more interpretative discussion. Additional care in proofreading would have eliminated a few confusing statements, such as (p 4) "...the sites of protonation are not necessarily identical with the location of the positive charge".

The following chapter by Y. Abe is a very readable, current, and well-organized treatment of the physical and chemical properties of alkaline-earth phosphate glasses, which focuses mainly on the extensive research carried out in the author's laboratories. Of particular interest to this reviewer was the discussion of the role of elemental phosphorus in the thermochromism and photochromism of some of these glasses and also the elaboration of the author's tension–induction model for the spontaneous crystallization below the "glass temperature". In addition to industrial chemists interested in the optical and mechanical properties of glasses, biomedical researchers in the field of ceramic materials as bone implants will find this chapter useful.

The third chapter is an update by M. W. G. de Bolster on the syntheses, structures, NMR properties, and applications of phosphoryl compounds reported since 1975. The current review is timely in that more papers in this area (>1400) have been published since 1975 than in the period 1854–1975 covered by an earlier review by de Bolster and Groeneveld in Volume 8 of this series. Most of the current review is devoted to a very well-organized 138-page compilation of phosphoryl coordination compounds along with the physical methods with which they were studied. (The publisher's failure to insert page numbers in the outline for this table does not detract seriously from the usefulness of the compilation.) Of special interest is the section wherein is described the usefulness of several phosphoryl coordination compounds in high-power liquid laser amplification and the catalysis of olefin polymerization and the potential application of volatile complexes in the preparation of thin metal films and metal isotope separation.

The fourth chapter by R. L. Hilderbrand, J. Curley-Joseph, H. J. Lubansky, and T. O. Henderson is a compactly written yet thorough and critical review of the distribution, metabolism, and structural properties of naturally occurring alkylphosphonic acids. Such molecules which contain a C–P bond have been isolated from a variety of organisms including human tissue and are found free as well as bound in lipids and proteins. The biological role of such alkylphosphonic acid derivatives, though probably important, is apparently not well-understood. Biomedical researchers interested in the antiviral properties of phosphonate systems (which are also discussed) should find this review stimulating.

The last chapter by H. R. Hudson consists of a broadly based and very informative review of quasi-phosphonium intermediates and compounds. Such species can be formally written as Z_4P^+ wherein one or more Z substituents is not an alkyl, aryl, or hydrogen. The treatment is very nicely systematized and covers in considerable detail the various routes to quasi-phosphonium systems as well as their mechanisms of thermal decomposition, reactions with nucleophiles, and their applications in organic syntheses. The only substantive errors noticed by this reviewer occur in Schemes 14 and 173 wherein the ring oxygens should not have changed positions with neighboring ring methylenes in the product and in Scheme 142 wherein the product should be $(MeO)_3P^+OCH(Me)COMe$.

A wide spectrum of phosphorus chemists as well as researchers in other specialties will find at least certain of these chapters sufficiently useful to justify considering the addition of this volume to their personal libraries, although the price ($85.00) may make it more attractive to request its purchase by their institutional libraries. Considering that camera-ready copy was used, the number of errors does not appear to be unusually large.

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Houben-Weyl Methoden der Organischen Chemie. 4th Edition. Organobor-Verbindungen I. Volume 13, Part 3a. R. Köster, Editor. 1982. xiv + 910 pages. DM 1040. Organobor-Verbindungen II. Volume 13, Part 3b. R. Köster, editor. 1983. xiv + 893 pages. DM 1080. Georg Thieme Verlag, Stuttgart/New York (in German).

The organoboron chemist is extraordinarily well supported by the review literature. There are books by Brown, Onak, Matteson, and Grimes that cover various aspects of the field; there are the many volumes of the Gmelin boron series and now organoboron compounds are treated within the framework of the well-known Houben-Weyl series. Two such volumes, 1703 pages total, have appeared and one more will join them shortly.

It is the concern of the Houben-Weyl series to bring not lists of compounds and their properties but rather a detailed account of the chemistry (synthesis, reactions, analysis) of the classes of compounds in question. As such, it complements the Gmelin inorganic and Beilstein organic handbooks.

The present volumes are concerned with the preparation of organoboron compounds of all kinds—in the first volume—triorganoboranes of all sorts, organoboron hydrides and halides, and organoboron compounds that contain substituents bonded via oxygen, sulfur, and selenium; in the second volume, organoboron compounds with substituents bonded via nitrogen, phosphorus, and arsenic and via group 4 elements, carboranyl organoboranes, organodiboron(4) compounds, organoboron compounds with σ bonds to transition metals, cationic organoboron(3) compounds, and four-coordinate organoboron compounds.

The organization of this wealth of information about the many preparative routes to these many different types of organoboron compounds into a coherent whole is a monumental accomplishment, and it is a successful one, thanks due to the efforts of Dr. Roland Köster and his collaborators. These volumes will be a great help to any chemist who wants to prepare any kind of organoboron compound.

Some useful features of these books should be pointed out: the excellent, detailed tables of contents; the large number of tables in which much preparative information is summarized (and an index of tables at the end of each volume); the many detailed preparative procedures from the literature; the many equations that greatly help the user who does not read German well to find his way about these books; the excellent bibliographies of reviews and monographs (particularly valuable is the cross-indexing to the appropriate Gmelin volumes in which individual compound properties are detailed); the index of compound types in each volume. All of these features combine to make the information presented in these volumes accessible and assimilable.

Like all their companions in the Houben-Weyl series, these books are well and attractively produced. We look forward to Volume 13, Part 3c, that will complete the organoboron series and that will bring details of the reactions of organoboron compounds and of their analysis.

Dietmar Seyferth, *Massachusetts Institute of Technology*

Modern Synthetic Methods. Volume 3. Transition Metals in Organic Synthesis. Edited by R. Scheffold. Otto Salle Verlag, Frankfurt, Verlag Sauerländer, Aarau, and Wiley, New York. 1983. 440 pages. $33.95 (paperback).

This book brings five reviews based on lectures presented by the authors at the International Seminar on Modern Synthetic Methods held in May 1983 in Interlaken. The subject, transition metals in organic synthesis, is one of great current interest, one in which chemists throughout the world are very active, one which has had a major impact on synthetic organic chemistry.

The book opens with a 60-page survey of the principles of transition-metal chemistry by John K. Stille. This is standard material and is aimed at the uninitiated: structure and bonding and then the processes that are involved when transition-metal chemistry is applied to organic synthesis: oxidative addition, reductive elimination, insertion reactions, nucleophilic addition to coordinated ligands, transmetalation, and homogeneous catalysis. After this quick course in transition-metal chemistry, the remaining four chapters focus on selected important aspects of the subject under discussion.

L. S. Hegedus summarizes the use of group 8 metal complexes (principally those of nickel, iron, and palladium) in organic synthesis in the first of these chapters. Hegedus is an old pro at such summaries; he has coauthored the leading textbook on organotransition-metal chemistry and has written a number of reviews on various aspects of the use of transition-metal complexes in organic synthesis. The present 78-page review covers, briefly with many equations, six topics: reactions of group 8 metal carbonyls, of group 8 metal alkyl complexes, of group 8 metal olefin complexes, of group 8 metal compounds with alkynes, of group 8 (π-allyl)metal complexes. The literature coverage in this discussion is broad, and within his limitations of space, Hegedus gives a good overview of his subject.

J.-F. Normant's two-part chapter, on the other hand, is quite narrow in scope. In the first section (31 pages) the preparation of conjugated dienes and enynes by use of organocopper reagents is discussed, while the second section (42 pages) brings an account of the use of organomanganese reagents in synthesis. The latter is a relatively new area of investigation, largely by Normant and his co-workers. The "organomanganese reagents" are solutions formed by mixing manganese(II) halides and main-group organometallic reagents (RLi or RMgX) in 1:1, 1:2, and 1:3 stoichiometry in ethereal solvents. Little is known about what actually is swimming around in these solutions, but whatever it is, has some advantageous application in the synthesis of organic compounds, especially of ketones from acid chlorides or anhydrides.

In the next chapter D. Seebach, B. Weidmann, and L. Widler bring a 137-page review of the noncatalytic applications of σ-bonded organotitanium and -zirconium derivatives in organic synthesis. This is a relatively new and fast-moving area, mainly due to the research groups of Seebach, Reetz (who also reviewed this area recently in Volume 106 of "Topics of Current Chemistry"), Tebbe, Grubbs, and, a bit earlier, Schwartz. This is an excellent, well-organized chapter that discusses in detail the special utility of these Ti and Zr reagents. As the authors point out, it is a matter of the selectivity of known transformations (C–C bond formation and functional group transformations) rather than of novel reactivity.

In the last chapter of 85 pages, R. Scheffold, G. Rytz, and L. Walder provide a review of the use of vitamin B_{12} and related cobalt complexes as catalysts in organic synthesis: in oxidation, in hydrogenation and hydrogenolysis, and in reductive processes. In the initial sections the types of such cobalt complexes and their synthesis and their properties and general reactivity are reviewed. This general area is one that has been covered in many reviews and monographs, but it is useful to have the present brief, well-organized review whose focus is on organic synthesis applications.

All in all, this is a book that the organic (and organometallic) chemist will find interesting and useful. The book is a direct reproduction of the typescripts, but the result is attractive. A feature that will enhance its utility to the synthetic chemist is the inclusion of quite a few representative experimental procedures in all chapters (except the introductory one). Futhermore, this is a book that the ordinary mortal can afford to buy.

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