

Book Reviews

Comprehensive Organometallic Chemistry. Edited by G. Wilkinson, F. G. A. Stone, and E. W. Abel. Pergamon Press, Oxford. 1982. 9 Volumes. \$2150.00.

Pergamon Press' previous ventures into the encyclopedic coverage of chemistry, "Comprehensive Inorganic Chemistry" and "Comprehensive Organic Chemistry", were both critical and commercial successes, so it made good sense to continue this ambitious endeavor. The continuation "Comprehensive Organometallic Chemistry", whose review we begin here, is an impressive achievement that also is certain to be a critical and commercial success. All volumes will be reviewed separately in this journal. However, it will be useful to the reader to have a brief orientation to the whole series of volumes in this, the first, review.

The first two volumes are devoted to the organometallic chemistry of the main-group metals and metalloids (the latter include boron, silicon, and arsenic), as well as of the coinage metals and the Zn, Cd, and Hg subgroup. Volumes 3, 4, 5, and 6 cover transition-metal and lanthanide and actinide element organometallic chemistry. Special chapters in these volumes are devoted to the bonding of unsaturated organic molecules to transition metals, nonrigidity in organometallic compounds, and compounds containing transition metal-other metal or -metalloid bonds. Volume 7 deals with the use of main-group organometallic compounds in organic synthesis and Volume 8 with the catalytic and stoichiometric applications of transition-metal compounds and intermediates in synthesis. Volume 9 brings subject, author, and formula indexes for all volumes and very useful indexes of structures determined by diffraction methods and of review articles and books devoted to organometallic chemistry. The editors deserve our congratulations for selecting such a good group of authors and for overseeing the completion of this endeavor in a reasonable time. "Comprehensive Organometallic Chemistry" will, for some years, be the first source that a chemist will seek out in order to orient himself in some aspect of organometallic chemistry. No library that serves organometallic chemists or chemists whose interests and activities have any connection with organometallic chemistry can be considered complete without these nine volumes.

Volume 1 (754 pages) covers main-group chemistry: the organometallic chemistry of the alkali metals, the alkaline-earth metals, and the group 3 elements, including boron. This volume begins with a general chapter by M. E. O'Neill and K. Wade on "Structural and Bonding Relationships Among Main Group Organometallic Compounds". The discussion of structure is superior to that of bonding. No mention is made of studies (such as those of Kochi and others) of the PE spectroscopic, charge-transfer, and electrochemical properties of organometallic compounds that have provided valuable information about bonding and bond strengths. Bond enthalpies are covered in less than 1 page. As might be expected, given the authors, the discussions of cluster structures, their classification, and the relationships between them are thorough and excellent.

The organometallic chemistry of *all* the alkali metals is covered in a single chapter by J. L. Wardell. Since organolithium compounds differ so greatly from those of the heavier alkali metals and since their reaction chemistry is so much more developed, it might have made more sense to have discussed them in a separate section or chapter. In this chapter are covered structure and bonding, stability, and preparative methods. Vinyl and alkynyl derivatives, delocalized species (allylic, benzylic, cyclopentadienyl), and aromatic radical anion and dianion species with alkali-metal counterions are dealt with in detail in separate sections. This is a good chapter that is particularly valuable in its discussion of structure and bonding.

N. A. Bell brings a good, well-organized (according to compound type) chapter on organoberyllium chemistry, one of the few

"element areas" of organometallic chemistry in which experimental activity has decreased in the last 10 years. This is followed by W. E. Lindsell's chapter on the other group 2A metals. Magnesium chapters cover are discussed separately, and a shorter section is devoted to the organometallic chemistry of calcium, strontium, and barium. The discussions of the constitution and structure of Grignard reagents and diorganomagnesiums are thorough, and their preparation is covered in some detail. The applications of organomagnesium reagents in organic synthesis are covered in Volume 7, but Lindsell in the present chapter devotes a few pages to general and mechanistic considerations of the reactions of Grignard reagents with organic substrates and to their use in the synthesis of organometallic compounds.

The six chapters that treat organoboron compounds and carboranes make up almost half of the book. The boron topics are noncyclic three- and four-coordinate boron compounds (J. D. Odam), boron in ring systems (J. H. Morris), boron ring systems as ligands to metals (G. E. Herberich), polyhedral organoboranes (T. Onak), metallacarboranes and metallaboranes (R. N. Grimes), and heterocarboranes (L. J. Todd). These chapters cover the vast area of organoboron chemistry well, but, unfortunately, the borazines were considered to be outside of the scope of the "boron in ring systems" chapter and were not discussed. The applications of organoboranes in organic synthesis are detailed in several chapters of Volume 7. The many figures in the polyhedral borane and metallacarborane chapters are well done. Without them, the material in these chapters would be impossible to assimilate.

The 128-page organoaluminum chapter by J. J. Eisch is an excellent one. It provides broad coverage of the field: structure and physical properties, dynamic equilibria, bonding and structural varieties in monomeric derivatives, preparation, chemical reactions, synthetic applications, and experimental techniques and analysis. The treatment is selective and critical and gives an excellent overview. The organic chemistry of the heavier group 3 elements is much less well developed than that of aluminum, so the Ga/In chapter by D. G. Tuck and the Tl chapter by H. Kurosawa are short ones. The Ga/In chapter is well organized. The Tl chapter would have been better if structural and spectroscopic results had been discussed in separate sections in more detail, as was done in Tuck's review. A discussion of the use of organothallium compounds in organic synthesis can be found in Volume 7.

While the information that each chapter brings will be very useful to the interested reader, the many references cited at the end of each chapter will be a bonanza to those seeking detailed information; for instance, 321 references in the alkali-metal chapter, 635 in the Mg/Ca, Sr, and Ba chapter, 1743 in the boron chapters, and 742 in the aluminum chapter.

With Volume 1, "Comprehensive Organometallic Chemistry" is off to a good start indeed!

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Comprehensive Organometallic Chemistry. The Synthesis, Reactions and Structures of Organometallic Compounds. Volume 2. Edited by G. Wilkinson, F. G. A. Stone, and E. W. Abel. Pergamon Press, Oxford. 1982. xii + 1020 pages.

Volume 2 of "Comprehensive Organometallic Chemistry" completes the coverage of the organic chemistry of the main-group elements that was begun in Volume 1 and includes as well the organic compounds of the elements of subgroups I and II.

Organosilicon chemistry has become a massive and very busy field of research, and 397 pages, over one-third of this book, are devoted to this subject. In four chapters are provided discussions of organosilicon compounds in general (D. A. Armitage), carbocyclic silanes (T. J. Barton), siloxanes (F. O. Stark, J. R. Falender, and A. P. Wright), and organopolysilanes (R. West). In the "general" chapter are treated silicon-carbon bonded compounds