

### Book review

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"Gmelin Handbook of Inorganic Chemistry", 8th Edition, New Supplement Series. Volume 37, "Boron Compounds. Part 10. Compounds with Four-Coordinate Boron", K. Beeker, B. R. Gragg, L. M. Frenzel and H. Rieger, volume authors, 1976, xx + 272 pages, DM 621 \$ 254.70; Volume 42, "Boron Compounds. Part 11. Carboranes, Part 3", I. von Wilucki, volume author, 1977, xiv + 207 pages, DM 493, \$ 217; Volume 43, "Boron Compounds. Part 12. Carboranes, Part 4", I. von Wilucki, volume author, 1977, xiv + 306 pages, DM 661, \$ 290.90; "Boron Compounds. Part 13. Boron-Oxygen Compounds. Part 1", G. Heller and A. Meller, volume authors, 1977, xvi + 239 pages, DM 551, \$ 242.50. K. Niedenzu and K.-C. Buschbeck, boron series editors, Gmelin Institut für Anorganische Chemie und Grenzgebiete der Max Planck Gesellschaft zur Förderung der Wissenschaften, Springer Verlag, Berlin/Heidelberg/New York.

Four new volumes have been added to the Gmelin New Supplement boron compound series, giving a total of thirteen thus far.

Part 10 deals with boron compounds in which the boron atom is four-coordinate. Included are  $\mu$ -thio, seleno, amino, and phosphino diborane(6) compounds, boronium salts of diverse types, salts of the tetrahaloborate ions and carbon monoxide adducts of boron hydrides,  $H_3BCO$  and higher  $H_nB_m(CO)_x$  complexes. Discussion of the boronium salts, which include those with  $L_2BH_2^+$ ,  $L_2BRH^+$ ,  $L_2BX_2^+$ ,  $L_2BR_2^+$ , (amine) $_3BX^+$ , (amine) $_4B^+$  and 1,4-diketone-derived boronium cations, takes up the greater portion (166 pages) of the book. Of the individual compounds to be found in this volume, the "diammoniate of diborane",  $(NH_3)_2BH_2^+BH_4^-$ , and borane carbonyl,  $H_3BCO$ , have received the greatest amount of study and require the most space.

Parts 11 and 12 continue the coverage of the carboranes. They deal with inorganic and organic derivatives, C- and B-substituted, of the three isomeric  $C_2B_{10}H_{12}$  carboranes, as well as with their derived mono- and dianions. These volumes are of particular value because of their detailed coverage of the very extensive Russian literature dealing with the organic chemistry

of the dicarba-closo-dodecaborane(12) cage system. As D. S. Matteson has commented in an Annual Survey of Organoboron Chemistry (Organometal. Chem. Rev. B, 8 (1971) 25), "There are an infinite number of possible carbon-substituted derivatives of carboranes, but Russian workers seem to be trying to make all of them anyway." In view of this massive synthetic effort, reported in countless papers in the Russian literature, this Gmelin coverage of this area is commendable. These two carborane volumes list thousands of such organic derivatives, principally of o- and m-carborane.

The considerable work on transition metal derivatives of the anions derived from the  $C_2B_{10}H_{12}$  cage systems is alluded to only briefly in a one page discussion, and detailed consideration of individual complexes is reserved for the Gmelin volumes devoted to the transition metals in question.

Part 13 returns to boron-oxygen compounds (begun in Part 7), covering polyol-borate complexes in solution, borate esters and acyloxyboron compounds of various kinds and boroxines. Heller's discussion of borate esters and related compounds starts with references since 1962 and relies on Steinberg's "Organoboron Chemistry", Vol. 1, "Boron-Oxygen and Boron-Sulfur Compounds" (Wiley, 1964) for coverage of prior literature. Even then, 66 pages in this volume are devoted to this subject. The  $B(OR)_3$  compounds as a class are surveyed in 37 pages of general discussion (synthesis; physical, structural, spectroscopic, gas chromatographic and thermodynamic properties; chemical reactions and industrial applications), and, in addition, there is more detailed consideration of  $(CH_3O)_3B$  and  $(C_6H_5O)_3B$ . Meller's 121 page review of the boroxines is most welcome since it is the only survey available of the complete field of cyclic  $\{B-O\}_3$  compounds.

These four volumes are welcome additions to the review literature of inorganic and organic boron chemistry. They have been prepared with the usual Gmelin thoroughness and are up-to-date (literature coverage for the most part through the end of 1975). Everything known about the compounds detailed - synthesis, physical and spectroscopic properties, chemical reactions, applications - is presented, backed up by copious literature references. Extensive tables provide valuable summaries of such information. These books for the most part are written in German, but those sections in Part 10 written by American authors (Gragg and Frenzel) are in English. However, as always,

English translations of the preface, the table of contents and the chapter and section headings will assist the reader for whom the German text will present difficulties.

Further volumes of this boron series are forthcoming.

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