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Book review

"Gmelin Handbook of Inorganic Chemistry", 8th Edition, New Supplement Series, Volume 45, "Boron Compounds. Part 14. Boron Hydrogen Compounds 1", K. Beeker, H. Keller-Rudek, R. Köster, H. List, H. Rieger and S. Trofimenko, volume authors, 1977, xxiii + 310 pages, DM 704, $323.90; Volume 46, "Boron Compounds. Part 15. Amine-Boranes and Related Compounds", K. Beeker, M. K. Das, L. M. Frenzel and B. R. Gragg, volume authors, 1977, xx + 170 pages, DM 407, $187.30; Volume 48, "Boron Compounds. Part 16. Boron-Oxygen Compounds 2", L. Barton, R. H. Cragg, U. W. Gerwarth, G. Heller and D. S. Matteson, volume authors, 1977, xviii + 221 pages, DM 571, $262.70. 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.

Reviewed here are three new additions to the Gmelin New Supplement boron compound series. The editors, we may note, have done a fine job in recruiting authors for these volumes, both within and outside the Gmelin Institute, including some well-known for their own research in organoboron chemistry: R. Köster, D. S. Matteson and S. Trofimenko.

Part 14 of the boron series begins with discussions of boron hydrides of diverse sorts, including the very simplest (BH, BH_2, BH_2^+, BH_2^-, BH_3^+, BH_3^-, BH_4, BH_4^+ and BH_5) and ammonia, hydrazine and amine adducts of BH_3, as well as complexes of BH_3 with other nitrogen donors. A major portion of the volume is taken up by an excellent survey of organodiborane(6) compounds — a general discussion covering spectroscopy and analysis, preparation, reactions and applications by R. Köster and a listing of individual compounds and their properties by S. Trofimenko. The concluding section of the book deals with halogenated boron hydrides and boron hydride anions which contain three or more boron atoms — from $B_3H_7Br^-$ through halogen derivatives of the better known

boron hydrides such as B_4H_{10}, B_5H_9, B_6H_{10} and $B_{10}H_{14}$ to halogen substitution products of the very stable $B_{10}H_{10}^{2-}$ and $B_{12}H_{12}^{2-}$ anions.

Part 15 continues the coverage of amine boranes. Included are amine adducts of dihydroboranes, i.e., of BH_2X (X = halogen and pseudohalogen), BH_2SR, BH_2SiH_3 and RBH_2; of monohydroboranes, BHX_2 (X = halogen), $BH(SR)_2$ and R_2BH; of trihaloboranes and tripseudohaloboranes. The coverage ranges broadly to include nitrogen donors other than amines: pyridine and other nitrogen heterocycles, nitriles, hydrazines, amides, phosphineimines, metal cyanides, etc. For the organometallic chemist, the chemistry of the amine adducts of RBH_2 and R_2BH will be of particular interest; especially the former provide the precursors for many interesting boron-containing heterocyclic systems.

Part 16 continues the survey of boron-oxygen compounds and reports on a variety of hydroxy- and alkoxy-boron derivatives: H_2BOH and $HB(OH)_2$ and their derivatives such as $HB(OR)_2$ and the useful catechol-borane; peroxyboranes, $B(OOR)_3$, $RB(OOR)_2$ and the autoxidation products of trialkylboranes, R_2BOOR; tetraalkoxydiborane(4) compounds, $(RO)_2B\text{-}B(OR)_2$; alkoxyboron compounds containing the $[(RO)_2B]_2C$- and $[(RO)_2B]_3C$- moieties, as well as $[(RO)_2B]_4C$; compounds containing the B-O-B linkage: R_2BOBR_2 and more complicated types; OBN-heterocycles (1,3,2-oxazaborolidines, 1,3,4-oxadiazadiborolidines, and others); borinic and boronic acids and their esters, R_2BOH, R_2BOR', $RB(OH)_2$, $RB(OR')_2$, as well as R_2BO_2CR'. Special classes included in this last section are R_2B chelate derivatives of β-diketones, 8-hydroxyquinoline and amino acids. Hidden (somewhat inappropriately) in the section on $(RO)_2B\text{-}B(OR)_2$ compounds are other compounds which can be viewed as B_2H_4 derivatives, but which do not contain B-O bonds: diborane(4)-Lewis base adducts, $B_2H_4 \cdot L$ and $B_2H_4 \cdot 2L$, organoboron polymers, $(RB)_n$, and anions, $[R_3B\text{-}BR_3]^{2-}$ and $[Me_5B_2H]^{2-}$, and B-B linkage-containing heterocycles.

All three volumes are up-to-date, with literature coverage complete through the end of 1975, but with some later references included. For all compounds listed the available information on physical and spectroscopic properties, preparative routes, chemical reactions and, where appropriate, applications, are given. Some chapters are

very nice, self-contained reviews of specific topics, with a general discussion as well as individual compound coverage. These are especially worthwhile when written by authors who have been active in research in the area in question. In Part 14 the Köster/Trofimenko R_2BH/RBH_2 chapters and in Part 16 the chapter by Matteson on gem-bis(organyldioxyboryl)alkanes and related compounds may be singled out as complete reviews of that type.

Part 14 is written in German except for the chapter by Trofimenko, which is in English. Almost one-half of Part 15 is written in English, and English predominates in Part 16. All volumes contain both German and English versions of the preface and table of contents, and translations into English of the chapter and section headings written in German are provided.

The production job is of the usual excellent Gmelin/Springer quality. Many formulas serve to clarify chemistry and structures for the reader and efficient presentation of data by tabular display is used throughout. The boron chemist is well served indeed by this ever-growing Gmelin boron series.

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