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Book reviews

Boranes and Metalloboranes: Structure, Bonding and Reactivity

C E Housecroft
158 pages. £29.95.
ISBN 0-7458-0459-4

It is the view of many inorganic chemists that boranes and metalloboranes constitute a narrow, specialized and somewhat obscure area which lies outside the mainstream of inorganic chemistry. However, the unique bonding properties of boron will always guarantee an extensive coverage in the standard general inorganic textbooks and current research in the area maintains a high profile in primary inorganic journals. Ever since they were first synthesized in the 1920s, the boranes (and their associated heteroboranes) have proved to be the toughest of challenges in all apsects, from the initial preparation, handling, and characterization to the overall description of their structure and bonding. Even now there are areas of controversy, and misconceptions and confusion abound. It is no surprise, then, that the subject is approached with some trepidation by teachers and students alike. It is with this in mind that this book, which is firmly targeted at an undergraduate audience, has been written.

The book is written in an easy-going, conversational style, uses plenty of illustrations and is ordered in a logical way. After an introductory first chapter (containing the obligatory highlighted Periodic Table, some definitions, and a brief explanation of nomenclature) the smallest borane, BH_4^-, is introduced and its bonding, structure and reactivity are discussed in some detail. Various physical techniques and their application (and limitations) to boranes are then described. Next, boranes and borane anions of increasing size and complexity are shown and their structures discussed; this is followed by a chapter which similarly deals with metalloboranes. The ball-and-spoke diagrams used in these chapters (and throughout the book) do not make any allowance for bond overlap and I found them to be confusing on occasion, particularly for some of the larger and more complex molecules. The clear textual descriptions do, however, more than make up for this. Bonding in both the boranes and metalloboranes is then considered in various ways. Detailed molecular orbital descriptions of borane clusters of increasing complexity are given. Wade's rules are clearly outlined and, using worked examples, they are carefully applied to boranes and (together with the isolobal principle) to metalloboranes. The book concludes with a chapter outlining some aspects of reactivity. It is not exhaustive, but acts rather as a taster: up-to-date references to more detailed reviews are given for those who want a more in-depth coverage.

Although I found the book to be well written and informative it does have a major weakness. Metalloboranes are, to all intents and purposes, a type of heteroborane. There are, of course, many other types of heteroboranes, but coverage has been restricted to metalloboranes alone. This somewhat artificial restriction has resulted in a book that covers only a part of what is already a specialized area. Admittedly the chemistry of heteroboranes, and carbaboranes in particular, is enormous but the book is only 158 pages long (including index and appendices) and there can be no justification for leaving them out on grounds of brevity. Consequently, many important features such as vertex-flipping and diamond–square–diamond rearrangements, which are more evident and more easily followed in heteroborane systems, are only mentioned in passing. More seriously perhaps, the large amounts of important chemistry more particular to the other heteroborane complexes are not covered at all. Inclusion of heteroboranes in a more general manner would provide a balanced coverage of the whole area. The book would then appeal to a much larger audience and tutors would be able to select those sections they perceive as relevant to their particular course. It must be said that boranes are usually fairly extensively covered in general inorganic textbooks. When this is considered alongside the book's price and the current state of funding to both students and educational institutions, it is difficult to envisage who might buy it other than those already involved in the very specific area at either teaching or research level.

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Progress in Clinical Biochemistry and Medicine Volume 10: Ruthenium and Other Non-Platinum Metal Complexes in Cancer Chemotherapy

E Baulieu *et al.* (eds)
Springer Verlag, Heidelberg 1989
226 pages. DM 138.

This volume consists of ten chapters presenting the plenary lectures of a symposium of the same title organized by the University of Trieste. The main emphasis is on the role of metal complexes in cancer chemotherapy, with some treatment of imaging and extensive discussion of the chemistry of the complexes

concerned. There is thus a wide range of approaches as well as a considerable range of chemistry.

The book actually contains more than is promised by its title, for the first article is entirely devoted to platinum compounds, providing a detailed discussion of the mechanism of their action as anti-tumour agents. Of course, platinum complexes also keep cropping up in the discussions in most of the other chapters. After the initial treatment of the parent platinum complexes, the emphasis in the next five chapters is on ruthenium. The scene is set in the second chapter with a review of relevant aspects of ruthenium chemistry, dealing in particular with possible modes of bonding in coordination complexes and in biological contexts, especially bonding to DNA. The third chapter deals in detail with a number of water-soluble ternary complexes containing halide and nitrogen-donor ligands, especially two imidazole–chloride–ruthenium(III) species of high antitumour activity but low toxicity. This article is complemented by the next, which deals with two further promising complexes, the *cis* and *trans* isomers of $[RuCl_2(DMSO)_4]$.

The fifth chapter widens the scope, dealing with a variety of complexes of a number of metals, including iron, cobalt, nickel, copper, rhodium, platinum and even mercury, and their role in radiosensitization. Chapter 6 returns to ruthenium, this time concentrating on the two specific radionuclides ^{97}Ru and ^{103}Ru. The former is particularly attractive for imaging. Several ligands that will be familiar to technetium chemists feature here, though a number of simple coordination complexes are also mentioned.

Chapter 7 returns to antitumour agents, covering cyclopentadienyl complexes of a number of transition metals. However there is, as one would expect, a strong emphasis on bis-cyclopentadienyl titanium dichloride; there is very little mention of the Main-Group elements (germanium, tin) promised by the title for this section. Titanium appears again as the central element for the final chapter, which deals mainly with one compound, the ethoxy–dione–titanium(IV) complex *budotitane*. Between these two articles on titanium come an interesting but only marginally relevant review of $[Cr(NH_3)_6]^{3+}$ as a probe in NMR relaxation studies of drug-binding sites, and a short report on cytotoxicity of some Group VIII complexes of chelating diphosphine ligands.

Every contribution to this volume is extensively referenced up to and including 1988 (the Preface is dated March 1989), and written in clear and readable style. The book is nicely presented—well printed and abundantly illustrated. The one disappointment is that there is no sign of the 'enthusiastic discussion' which, according to the Preface, followed each lecture at the Symposium. This is a pity, since such discussions often contain useful and thought-provoking snippets of information. Nonetheless this volume can be strongly recommended. It is not cheap (around £40/$80), but it does provide a number of useful, interesting, and reasonably up-to-date reviews of a consistently high standard of presentation.

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Inorganic Syntheses, Volume 28
Robert J Angelici (ed)
Wiley–Interscience, New York, 1991
Pp xiii + 463. £43.65. ISBN 0 471 52619 3

The Inorganic Syntheses series provides reliable and foolproof procedures for the preparation of a wide variety of inorganic and organometallic compounds. In previous volumes the syntheses chosen are usually of general interest but it is unlikely that most chemists would find all sections of equal interest. However, Volume 28 is different in that it focuses attention on basic starting materials that would be of interest to all those who have need to prepare transition-metal coordination and organometallic complexes.

There are chapters on complexes which contain easily displaceable ligands, e.g. BF_4^-, $OSO_2CF_3^-$, C_2H_4, N_2, Me_2CO; low-valent metal complexes that undergo oxidative addition reactions, e.g. $RhCl(PPh_3)_3$, $Pt(PEt_3)_4$, $Pt(C_2H_4)_3$, $Ni(PPh_3)_4$, $[IrCl(CO)(PPh_3)_2]$; substituted metal carbonyl complexes, e.g. $Cr(CO)_3$ (η^6-arene), $Mo(CO)_x(CNR)_{6-x}$, $[CpMo(CO)_3]_2$, $MnCl(CO)_5$; carbonylate anions, e.g. $[Nb(CO)_6]^-$, $[Fe(CO)_4]^{2-}$, $[CpFe(CO)_2]^-$; metal carbonyl clusters, e.g. $Ru_3(CO)_{12}$, $Os_3(CO)_{11}(MeCN)$, $H_4Os_4(CO)_{12}$, $Ir_4(CO)_{12}$; cyclopentadienyl complexes, e.g. $Cp_2Ti(CO)_2$, Cp_2ZrH_2, $CpCo(PMe_3)_2$; lanthanide and actinide complexes, e.g. $LnCl_3(THF)_x$, Cp_3Ln, Cp_3UCl; and finally a chapter on the synthesis of ligands and other useful metal complexes, e.g. PF_3, PMe_3, C_5Me_5H, anhydrous metal chlorides, $Re_2Cl_8^{2-}$, $[RuCl_2(CO)_3]_2$, $[PdCl(\eta^3C_3H_5)]_2$, $K[PtCl_3(C_2H_4)]$, to mention but a few.

Most of these syntheses are taken from previous volumes of Inorganic Syntheses but the original authors in all but one case have made any necessary improvements, added safety notes or made changes to references. Nine new syntheses are included.

As usual, the volume is well presented and referenced. Collecting so many useful complexes together in just one volume will be helpful. All chemistry libraries should have a copy and chemists in the area would find it very useful to have it in their laboratories.

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