

Book reviews

Contemporary boron chemistry

M. G. Davidson, A. K. Hughes, T. B. Marder and K. Wade (eds)

Royal Society of Chemistry, Cambridge, 2000

xvi + 538 pages. £92.50

ISBN 0-8504-835-9

The chemistry of boron and its compounds continues to diversify, and this book, being a summary of 81 papers presented at the latest in the triennial series of Imeboron conferences, provides a survey of the recent progress in this area. Nine chapters, extending to 538 pages, cover a very broad area, with topics ranging over metal-catalysed boration reactions of organic compounds, applications to polyolefin catalysis, medicinal uses [mainly in boron neutron capture therapy (BNCT)], boron clusters, metallaboranes and metal boryls, materials [polycarboranes, carborods, non-linear optic (NLO) compounds, etc.] and theoretical and computational studies on species including metal borides.

The 81 individual articles, each with an extensive list of references, are written by leaders in the various fields and contain a wealth of detailed information on the topics that are currently causing such interest and excitement in boron chemistry. Prominent among these topics is the research into boron clusters and linked clusters, including those containing a metal, a non-metal or both, and nearly half of the book deals with this rapidly expanding area.

A noteworthy feature of the general area is that, following several decades of largely fundamental research on boron compounds, considerably more potential applications are now beginning to emerge. This theme is reflected in many of the articles in each of the chapters, and may be exemplified by the role of $B(C_6F_5)_3$ in activating metallocene-based olefin polymerization catalysts, the isolation of materials such as boron-containing π -conjugated and thermoplastic polymers and C_{60} - π -carborane rigid-rod hybrids, together with other boron polyhedral systems that show NLO properties. In the medicinal field, many of the reports illustrate attempts to attach boron-rich clusters and polymers to tumour-targeting species for use in radiotherapy (BNCT); also, the use of organoboron compounds in organic transformations (selective C—C bond formation, catalytic hydroboration, and Diels–Alder, stereoselective, asymmetric synthesis reactions, etc.) continues to gain prominence.

The editors have done an excellent job in compiling this volume, which is produced to a very high standard. The articles are well written, there are very few errors, and there is a useful author index. If anyone wants an authoritative update on the recent important develop-

ments in the chemistry of boron, then this is the book to consult.

The volume is fittingly dedicated to the memory of Stanislav Heřmánek, who was one of the organizers of the first Imeboron conference held in 1971 in Czechoslovakia.

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Fullerenes: chemistry, physics and technology

Karl M. Kadish and Rodney S. Ruoff (eds)

John Wiley & Sons Inc., New York, 2000

ix + 968 pages. £126

ISBN 0-471-29089-0

This is a substantial volume with a very wide coverage of fullerene science, plus additional chapters on aspects of nanotubes. The work is authored by leading practitioners in their fields, e.g. Echegoyens and Diederich on electrochemistry, Green and Sloan on filled nanotubes. The fullerene areas covered, by chapter, are electrochemistry, solubility, organic chemistry (a substantial account of nearly 90 pages), structural inorganic chemistry, photophysical properties, calculations, polymer derivatives, endohedral metallofullerenes (two chapters), biological aspects, carboxyfullerenes as neuroprotective antioxidants, neutrals and ions in the gas phase, interactions with surfaces, structures of fullerene-based solids, fullerenes under high pressure, superconductivity, and [36]-fullerene. The nanotube topics are BN-containing nanotubes, materials incorporated into nanotubes, and a chapter on carbon-encapsulated metal nanoparticles is also included. In general, the topics give a fairly comprehensive coverage; however, considering the title, given that nanotubes are included, it is a little surprising that there is no specific coverage of their preparation and purification. Thus, for example, Harris's book on nanotubes is not cited.

The chapters are copiously referenced, and all but

three give leading review references, making this an invaluable source of information. Most chapters concentrate on more recent results, approximately for the period 1995–98, although there are several references to 1999 literature, and occasional citations (mainly to the authors' own work) from the 2000 literature. The chapters on theory, production and separation of endohedral metallofullerenes, and fullerene derivatives as neuroprotective agents, give more general accounts, whereas those concerned with fullerene-based solids and superconductivity include significant discussion of earlier work.

Concerning some of the individual chapters, the first two (electrochemistry and solubility) contain valuable tabulations of data, and even Chapter 3 (organic chemistry) helpfully summarizes many reactions in tabular form. Inorganic compounds are treated from a structural standpoint, and the discussion is provided with a wealth of data supplemented by many clear structural diagrams. The photophysical chapter has condensed the vast literature into a mere 47 pages, and includes fullerenes and their derivatives, behaviour in films, and electron- and energy-transfer processes. The chapter on theory is a non-mathematical one, although readers will need some familiarity with the terminology of current methods. Thus, although Hartree–Fock (HF) and self-consistent field (SCF) are explained for us (perhaps surprisingly) the B3LYP/6–31G**/SAM1 approach is introduced without further ado. Considering the difficulties and low yields reported for the preparation of many endohedral metallofullerenes, the practical details pro-

vided in the chapter on this topic should prove very useful. The chapter on solid-state structures focuses mainly on pristine fullerenes and their intercalation compounds rather than on chemical derivatives, and is helpful in drawing together the results from a variety of techniques. The account of high-pressure chemistry appears to be the first to give a general review including pristine, doped and polymeric derivatives. The superconductivity chapter is substantial (*ca* 65 pages plus 260 references), giving a general overview of this much-reviewed field, but excluding *inter alia* theoretical and NMR studies. Finally, the account of materials within nanotubes, although provided with references to earlier literature, is mainly valuable in providing a state-of-the-art account of the filling and characterization of these assemblies, the literature being principally from 1997–99.

In summary, this compilation is an invaluable source for those interested in fullerenes and nanotubes, in many cases providing the most up-to-date survey of the area. It is reasonably cross-referenced between chapters to prevent unnecessary duplication, substantially free of typographical errors, and well produced. I foresee it being well thumbed in all laboratories with any interest in the field.

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