

## Book reviews

*Stereodirected Synthesis with Organoboranes*  
D.S. Matteson, Springer, Berlin, 1995, xi + 405 pages,  
DM 198.  
ISBN 3-540-59182-6

This volume gives a detailed description of the methods currently available to chemists for the preparation of stereochemically defined organic compounds with the assistance of boron reagents. The work highlights many of the exciting opportunities which exist for utilising this versatile class of compound in complex molecule synthesis. Chapter One sensibly starts with an overview of the general properties of organoboranes, including tabulated data (bond strengths, etc.) along with some useful information on bonding, ligand exchange, practical handling and safety aspects. Chapter Two concentrates on sources of boron and methods for the introduction of boron into organic molecules, the two main strategies highlighted here being the use of organometallic reagents and hydroboration. The incorporation of metal-assisted hydroborations is well-deserved, particularly in view of the developments in asymmetric hydroboration which are treated in a later chapter. Chapter Three is entitled "General reactions of organoboranes" and is interesting to delve into at random; however the subject matter covered does not lend itself to continuous reading. Sections include: oxidative replacement of boron; boron substituted carbanions; replacement of boron by carbon; allylborane chemistry; and reactions at sites other than the B–C bond. Although a little disjointed this chapter is very interesting and a range of useful transformations are covered, including the increasingly popular use of radical displacement reactions and addition of allylboranes to heteroaromatic systems. Chapter Four, covers routes to unsaturated compounds using alkenyl boranes, and includes a nice section on the Suzuki coupling reaction. Chapter Five examines "Asymmetric synthesis via ( $\alpha$ -haloalkyl)boronic esters" and there is significant coverage of diastereocontrol using the ubiquitous chiral, non-racemic  $C_2$  symmetric diols; the section on func-

tional group compatibility in this chapter is a thoughtful inclusion. Chapter Six on "Asymmetric hydroboration" incorporates methods for achieving asymmetric hydroboration via substrate or reagent control and methods of utilising these versatile intermediates once prepared. Allylboron reagents and boron enolates are discussed in Chapter Seven although, for some readers perhaps the latter section may be disappointingly brief. Diels-Alder reactions are the subject of Chapter Eight and the volume concludes with a "Miscellaneous" chapter which contains, once again, some fascinating transformations and recent developments in asymmetric catalysis and desymmetrization strategies.

I would question some of the organisation of the chapters, but overall I liked the book. I suspect that most readers will enjoy it more by dipping into it at random as opposed to reading the entire volume, particularly in view of the mountain of useful information it includes. The author has illustrated a number of points by giving plenty of examples of natural product synthesis, I found this a very pleasing aspect of the book. There is a good contents list, and the author and subject indexes are also useful. The volume is well produced and the author is to be congratulated on the work, which would be a useful addition to any personal collection or library.

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*The Chemistry of Metal CVD*

T.T. Kodas and M.J. Hampden-Smith (eds.), VCH,  
Weinheim, 1994, xxiv + 530 pages, DM 228, £91.  
ISBN 3-527-29071-0

Chemical vapour deposition (CVD) has become a key technique for the manufacture of thin films in the

electronics and coatings industries, and organometallic chemists have written countless research proposals claiming that the substances they planned to study would prove to be CVD precursors. Such proposals have however been plausible only when two-way communication has been established between materials scientists and device manufacturers on the one hand and chemists on the other. Successful exploitation of organometallic compounds as CVD precursors has required that problems encountered at the manufacturing stage be referred back to the precursor suppliers. The overall aim, to achieve controlled and coherent growth with abrupt changes in composition, critically depends on adjusting chemical factors such as volatility and thermal stability as well as process variables such as equipment configuration, flow rates and temperature.

This book is about metal CVD; it does not discuss production of thin films of semiconductors or other non-metallic materials. It comprises an introductory chapter which covers general points about manufacture of silicon devices and likely requirements for the year 2001, and compares CVD with techniques such as evaporation or sputtering for production of carbon-free metal films. This is followed by chapters on the CVD of aluminium, tungsten, copper, gold and silver, platinum, palladium and nickel. The remaining metals are considered in a further chapter and the book concludes with an excellent overview bringing together points from all the other chapters and articulating general themes. This final chapter contains tables showing precursors for particular metal films and tables of precursor types showing the range of metals for which they are available. There is also a general index and a glossary.

The editors have persuaded a number of experts, mainly from university departments but some from industry, to write the various chapters. They have imposed an unusual degree of editorial control so that the book has little of the incoherence and inconsistency that are so often characteristic of multi-author works. Each chapter begins with an abstract of about 100 words and ends with a section of one–two pages called Summary and Outlook. There are 100–300 references per chapter, many of them as recent as 1993. The editors themselves have written the concluding chapter and contributed to some of the others.

This book will be invaluable to all those thinking about the possibility that the compounds they have made can be used for CVD. It will also be useful to physicists and materials scientists who need to be familiar with the chemistry of the substances they are using in their CVD processes. There is a great deal of organometallic chemistry here — on aluminium alkyls and hydrides, tungsten carbonyls and organometallic compounds of silver, gold and the platinum group metals. The precursors for copper films are mainly  $\beta$ -diketone complexes and so contain metal–oxygen rather

than metal–carbon bonds. There is also a good deal about techniques which is not readily available in other monographs on organometallic compounds. In short, this is a truly interdisciplinary book and the editors have undoubtedly achieved their aim to bring together the work of chemists, chemical engineers, materials scientists and electrical engineers in this important and intellectually demanding area.

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*Photochemistry and Photophysics of Metal Complexes*

D.M. Roundhill, Plenum, New York, 356 pages.

ISBN 0-306-44694-4

In an age of the multi-author, multi-chapter 'book', it is refreshing to see a *real* book by a *single* author. Professor Roundhill explains in his preface that inorganic photochemistry has become an extremely broad subject, too broad for a single volume to be encyclopaedic but broad enough to be an excellent topic for a special course. This book, therefore, is intended "as both a reference source and as a teaching text". There are nine chapters, each divided into subsections. Apart from an introductory chapter, the photochemical topics are divided into: first row metals; monomeric complexes of second and third row metals; dimeric and multimetallic complexes of these metals;  $\text{Ru}(\text{bpy})_3^{2+}$  and related complexes; transition metal carbonyls and isocyanide complexes; transition metal alkene, arene, alkyl, hydride and carbene complexes; lanthanide and actinide complexes; and finally, metal porphyrins, phthalocyanins and metal ions in supramolecular chemistry. Overall, a range of topics quite sufficient for special courses at senior undergraduate, starting post-graduate level.

I began reading the book with considerable optimism but, as I went on, I felt increasingly disappointed. My disappointment was two-fold. Firstly, the author has produced an extremely good imitation of a multi-authored book. Secondly, there is an abundance of material but relatively little critical comment. Like the multi-authored book, each chapter is essentially independent, each with its own set of references, albeit with a good citation of pertinent reviews. With a broad range of topics, there must obviously be some overlap between chapters but the opportunities of the single-authored book seem to have been missed. For example, the work of Rest and coworkers on  $(\text{C}_5\text{H}_5)_2\text{Cr}(\text{CO})_2$  Me