

Book reviews

Organometallic Chemistry, U.O. Spessard and U.L. Miessler, Prentice-Hall, New Jersey, 1996, 561 pp., £24.95, ISBN 0–13–640178–3

I picked up this book in the hope that it would be a cheaper, student-friendly version of Collman, Hegedus, Norton and Finke's wonderfully inaccessible (and a bit dated) *Principles and Applications of Organotransition Metal Chemistry*, since I think that there is certainly a need for a text of that type. Unfortunately this book covers much the same material as other books in the area, like Elschenbroich and Salzer's *Organometallics* and Crabtree's *The Organometallic Chemistry of the Transition Elements*, if arranged somewhat differently. The presentation is, however, clear and unpretentious, and there are some good sections which, given the relatively low price for the hardback, could make this book a useful undergraduate purchase.

After wandering off into MO theory for far too long, the authors launch into a familiar description of organometallic chemistry of the transition metals arranged by ligand type. Following this comes the best part, that on reactions at the metal and ligands and applications to catalysis and synthesis. Although I think it a bit odd to have Ziegler–Natta chemistry in the carbene/carbyne section, the treatment here is lucid and imaginative and the problems useful. If you buy this book it will be for these chapters. The section on the isolobal analogy is also particularly clear and fresh, but that on cluster compounds is treated better in other popular inorganic texts. The book ends with a throw-away chapter lumping together short treatments of all those subjects that you wish you knew more about, like bio-organometallics, organolanthanides and surface chemistry. There is also the compulsory section on fullerene complexes, without which nothing can get past editors these days.

There are a few minor points worth making. Firstly, there is no main-group organometallic chemistry mentioned, except in passing, making the rather unoriginal title of the book also somewhat misleading. Secondly, despite the enormous plug in the Acknowledgements, the CAChe drawings are not all that clear in the final imprint. Also, there are some imperfect molecular line-drawings. Thirdly, the cycloheptatrienyl ligand is described as “tropylium,” or $C_7H_7^+$; a look at the last

few years' literature on this subject should have revealed that this is no longer an adequate description.

If this book comes out as a paperback, the world's undergraduates might be inclined to use it instead of the more expensive hardbacks mentioned earlier, particularly when looking for something with a simple informative treatment of applications of transition metal organometallics to organic transformations.

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Metal–Ligand Interactions, Structure and Reactivity, N. Russo and D.R. Salahub (eds.), NATO ASI Series C: Mathematical and Physical Sciences, Vol. 474, Kluwer Academic Publishers, Dordrecht, Netherlands, 1996, pp. 552 + xiv, DM380, US\$266, UK£169, ISBN 0–7923–3833–2

This volume is based upon the invited lectures given at a NATO Advanced Studies Institute held in Italy in September, 1994. The casual observer would be forgiven for being misled by the title of this book. One might expect to read about metal ions, ligands and ligand fields, magnetism and spectra, reactions of ligands, and all the related phenomena. In fact the contents turn out to be rather broader and rather different.

The first contribution discusses DET calculations on metal–ligand interactions and the mechanism of the enzyme activity of carboxypeptidase, very specific and rather sophisticated. The next describes guided-ion beam studies of ionic clusters and complexes, but little of this refers to normal, stable complexes. Then comes a review of the influence of silyl ligands on the reactivity of heterobimetallic complexes. This is certainly more the kind of material of interest to organometallic chemists, but is it really what the book title might lead one to expect?

The next review covers mixed-metal clusters, but there then follows a discussion of ligand-metal surface interactions. This is surface chemistry. The diversity of topic characterises the whole collection, with conventional coordination and organometallic chemistry mixed with discussions of metal particles, metal clusters, oxide surfaces, and theoretical analyses.

I cannot comment on the quality of such a diverse set of reviews, 18 in all, neither would I suggest that they did not make a good Advanced Studies Institute. From the editors' comments it was clearly enjoyable, but I do feel that the material is so diverse as not to be suitable for publication between the same covers. The NATO Science Committee should consider the contents and potential audience of such a book before deciding whether to publish. Although many might well wish to read some of the contents, few would wish to read them all, and only a very few would be prepared to pay so much for the privilege.

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Deciphering the Chemical Code, Nicolaos D. Epiotis, VCH, New York, 1996, xvii + 933 pp., \$89.95, ISBN 1-56081-946-4

This book represents a massive effort to reinterpret ideas of chemical bonding based on modern computational methods as well as experimental information during the past several decades on a variety of chemical substances. The familiar trichotomy of covalent, ionic, and metallic (delocalized) bonding appears in considerably modified form as T bonds, E bonds, and I bonds, and the ideas are developed from non-orthogonal valence bond theory without using any of the basic ideas of molecular orbital theory.

This mammoth book, containing no less than 43 chapters, is very reasonably priced for its size. It is divided into the following five major parts: *I. The Valence Bond Theory of Chemical Bonding* (52 pages); *II. The T Bond* (154 pages); *III. The Molecular T Bond* (484 pages); *IV. The Cluster I Bond* (160 pages); *V. Chemoelectricity, Chemomagnetism, and Beyond* (72 pages). Organometallic compounds play a prominent role in much of the theoretical development in this book, e.g.:

(1) Chapter 21, with the title *The Relay I Bond and the Foundation of Organometallic Bonding* (12 pages), discusses allyl and cyclopentadienyl derivatives of main group metals;

(2) Chapter 24, with the title *The Chemical Code Cracks in the p-Block*, includes a discussion on ligand attraction in square pyramidal $\text{Bi}(\text{C}_6\text{H}_5)_5$;

(3) The relatively long Chapter 26, with the rather cryptic title *...and It Shatters in the d Block* (40 pages), includes metal carbonyls, metallocenes, and platinum-olefin complexes in its discussion.

In the development of this new theoretical approach the author has clearly assimilated a vast amount of experimental information on essentially all of the exciting types of substance discovered during the past decades. This includes not only the organometallic compounds mentioned above but other currently significant areas, including fullerenes (Section 16.6) and high critical temperature superconductors (Chapter 41). Chapter 42, with the intriguing title *Is There Hyperbonding and Hyperchemistry*, even includes a brief discussion of 'cold fusion'. The theory underlying the effort in this book to reinterpret chemical bonding is clearly a work of unusual creativity. Many of the ideas in this book are likely to stimulate chemical thought for the next several decades, so that by the year 2050 this book has the potential to become a real classic similar to Pauling's book *The Nature of the Chemical Bond*. Unfortunately, however, assimilation of Epiotis' book by the chemical community is likely to be very slow because of the variety of new concepts involved. Thus the "Pictorial Glossary" at the beginning of this book explaining the most critical concepts needed to understand this book is 17 pages long. Also, many of the new ideas are presented in rather unfamiliar and unusual terminology, apparently in order to avoid confusion with established ideas. For this reason, deciphering the interesting ideas presented in this book and truly understanding them is likely to take the chemical community many years. This book may well be a preview of chemical bonding theory in the 21st, and possibly even the 22nd, century.

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Metals and Ligand Reactivity, E.C. Constable, VCH, Weinheim, 1996, pp. 312 + xiv, ISBN 3-527-29278-0 (hardcover), ISBN 3-527-29277-2 (softcover), DM128 (hardcover), DM68 (softcover)

This text is the second, revised, and expanded edition of a book that is an introduction to the organic chemistry of metal complexes. It aims to provide a general readership with sufficient background knowledge to understand the bases of this rather recent subject, and