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Book review

An Introduction to Organometallic Chemistry; by A.W. Parkins and R.C. Poller, Macmillan Publishers Ltd., 1986, ix + 252 pages, £25.00, paperback £10.00. ISBN 0-333-36432-5, ISBN 0-333-36433-3, Pbk.

During the last two years, there has been quite a spate of single volume texts designed for advanced undergraduates, or early postgraduates, devoted to organometallic chemistry. Thus, the book under review may be seen as a competitor with (1) I. Haiduc and J.J. Zuckerman, *Basic Organometallic Chemistry*, de Gruyter, 1985; (2) C.M. Lukehart, *Fundamental Transition Metal Organometallic Chemistry*, Brooks-Cole, 1985; (3) A. Yamamoto, *Organotransition Metal Chemistry*, Wiley-Interscience, 1986; and (4) J.P. Collman and L.S. Hegedus, *Principles and Applications of Organotransition Metal Chemistry*, University Science, 1980. Of these, 2–4 deal only with appropriate transition metal chemistry. Additionally, there have been other recent books describing the uses of organometallic compounds as reagents for synthesis or as catalysts.

The authors' aim is to provide an integrated view of the organometallic chemistry of the transition and non-transition elements. This claim seems to be justified. Drs. Parkins and Poller are specialists in these two fields, respectively; the former is best known as an inorganic chemist while his partner is a practitioner of organic chemistry. It is undoubtedly a strength of the book under review that the experience and training of the authors are complementary. The text is well written and key references are well chosen.

The authors have decided to exclude detailed consideration of metal carbonyls on the reasonable ground that adequate coverage of this subject is to be found in inorganic text-books.

Chapter 1 is introductory and brings together various useful strands. However, I doubt whether the Eighteen Electron Rule is really worth dealing with as a key topic, keeping in mind that discussion of the carbonyls is excluded. Certainly, the assertion that "most π -complexes of the transition metals conform to this rule" is incorrect.

The second chapter deals with the preparation of organometallic compounds. This section includes a notable typographical error on p. 24 ("cyclopentadiene anion") and also the questionable assertion (p. 30) that in hydrosilylation "the active catalyst is considered to be a platinum(II) complex..."

The third chapter provides a useful general description of structure and bonding. Relatively minor criticisms would query whether an MO scheme for dibenzene-chromium warrants a whole page (p. 70) and would draw attention to the choice of terminology on p. 75–76, where the mean bond dissociation energy \bar{D} is referred to as the "mean bond disruption enthalpy".

Chapter 4 deals with organometallic compounds as a source of carbanions. I consider that a brief summary of Grignard reactions would have been valuable (e.g., as a model for the M–C bond-breaking step in hydroboration or hydrozirconation).

Chapter 5 treats effectively the reactions of coordinated ligands, but I am not entirely convinced that the space devoted to this relatively minor topic is justified.

Chapter 6 is headed "The Coordination Chemistry of Organometallic Compounds" and, despite this rather curious title, is really concerned with basic organometallic reactions such as oxidative addition.

Chapter 7 is concerned with the role of carbenometal complexes in organometallic chemistry, and Chapter 8 describes "Stoichiometric Applications of Organometallic Compounds to Organic Chemistry". While the latter is certainly useful, I would have expected the topic of hydroboration, in particular, to warrant a more detailed discussion.

Chapter 9 is entitled "Catalytic Applications of Organometallic Compounds" and deals with fairly predictable reactions and processes. However, the potential energy diagram shown on p. 215 is surely misleading, in that the reader would infer that the role of the metal is simply to lower the activation free energy for a process, rather than to do so partly as a consequence of there being discrete and distinct organometallic intermediate or intermediates.

Despite the above criticisms, this is a valuable book and, arguably, the best single slim text on this area of chemistry.

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Bond and Structure Models. (Structure and Bonding 63), Springer-Verlag, Berlin, Heidelberg, New York, Tokyo, 1985, v + 205 pages, DM98. ISBN 3-540-15820-0.

This volume contains four reviews, three of which clearly fall under the general heading of bond and structure models. The fourth and last review, describing the chemistry of chromium(IV) and chromium(V), is uncomfortably out of place here.

The first article is a detailed and lucid exposition of a new stereochemical model, the complementary spherical electron density model (D.M.P. Mingos and J.C. Hawes; 63 pages; 98 refs.), which treats molecules as interpenetrating spheres of electron density and tries to unify the inert gas rule and molecular orbital formalisms. It is built upon the assumption that the wave functions of ligands can be expressed in terms of spherical harmonics, and can interact in a complementary manner with the valence orbitals of the central atom to give a complete set of molecular orbitals, which then emulate those of an inert gas, both in number and in nodal characteristics. The model thus explains the stereochemistries of both main group and transition metal complexes. This is a novel and unique approach, and it is too early yet to assess its general utility, but this excellent review will do much to help it become established.