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Book Review

Transition metal carbonyl cluster chemistry
P.J. Dyson, J.S. Mcindoe (Eds.); Gordon and Breach Publishers, London, 2000, xi + 166 pages, hardbound, ISBN 90-5699-289-9, GB£ 26.00 (US$ 40.00, € 44.00)

As the lecturer of a final year undergraduate course on cluster chemistry, I received this book with keen anticipation. The book, which is part of a series of Advanced Chemistry Texts, is indeed aimed at final year BSc or MChem/MSc students, or postgraduates starting research in the field of cluster chemistry.

The book is essentially divided into two parts: the first five chapters cover an introduction to clusters, their bonding, structures, spectroscopic properties and characterisation; the remainder of the book deals with the synthesis, reactivity and reaction mechanism of homo- and heterometallic clusters, and their application in organometallic synthesis and catalysis.

After a brief introduction to clusters in general and to transition metal carbonyl clusters (TMCCs) in particular, there is a clear description of the models and rules which have been developed to correlate cluster structure with electron count. Worked examples are provided of the application of these rules, which underpin the reactivities and dynamical properties, as well as the structures, of TMCCs. Subsequent chapters detail the structures adopted by TMCCs, how these structures may be interconverted chemically and the bonding of the carbon monoxide molecule, and other molecules and fragments, in transition metal complexes and clusters.

An important aspect of cluster chemistry is that of experiments which probe the structures, stabilities, dynamics and reactivities of clusters. In this book a number of characterisation techniques are discussed, ranging from IR and NMR spectroscopies to diffraction and microscopic techniques. Although this chapter represents a good overview of the field, I feel that a greater coverage of the applications of multinuclear NMR techniques to the study of cluster cage and ligand fluxionality would have been useful.

I found the second half of the book (synthesis, reactions and synthetic application of TMCCs) to be particularly well written and interesting, with a large number of examples, reflecting the considerable experience and expertise of the authors in this area. In these later chapters emphasis is placed on the differences between the reactivities of clusters and those of mononuclear metal complexes, particularly due to the availability of multiple-bonding sites and heterosite reactivity. In the final chapter a number of reactions are discussed, in which clusters, rather than mononuclear complexes, act as homogeneous catalysts. This chapter also contains a brief discussion of recent work on the use of (solid and biphasic liquid–liquid) supported clusters in heterogeneous catalysis.

I believe that this book gives a good all-round coverage of TMCC chemistry, that will definitely be of use to those (such as I) teaching (or studying) advanced courses in cluster/organometallic chemistry, as well as to postgraduates working in the area of cluster chemistry. It complements well the existing texts (notably those of Mingos and Wales, and of Housecroft). The book is well written and easy to follow and the figure reproduction is good. There are a number of boxes containing material on more specialised topics, and a list of references to other books and review articles. I think this will be a popular book among students. The book is reasonably priced and should find its way into departmental libraries and the personal collections of academics with interests in cluster and organometallic chemistry. It is to be hoped that a paperback edition will be produced as this would be more likely to attract student buyers.

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