

Book Reviews

Cluster Chemistry: Introduction to the Chemistry of Transition Metal and Main Group Element Molecular Clusters,

G. González-Moraga, Springer-Verlag, Berlin, Heidelberg, 1993, 302 pages. DM98.00
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This book presents a thorough review of the field of organic cluster chemistry, by which I mean those clusters (usually ligated) that can be obtained in solution or in the solid state in sufficient quantities for structural elucidation, rather than the gas phase clusters of semiconductors, metals, inert gases, small molecules *etc.* familiar to physical chemists and physicists. The book is aimed at senior undergraduate and postgraduate students and is intended to aid the teaching of cluster chemistry.

The first chapter is a concise review of current theories of the electronic structures of atoms, molecules and solids. This serves as a useful introduction to the theoretical sections of the remainder of the book. The final section of the chapter deals with multiple metal-metal bonding in metal dimers an area of research which may be said to have initiated the field of metal cluster chemistry.

Chapter 2 is a detailed review of the structures, bonding characteristics, synthesis and reactivity of transition metal clusters. There is also a section on catalysis by transition metal clusters. The abundance of tables and the exhaustive list of references make this chapter a useful entry point to the original literature.

Mixed main group-transition metal clusters are the subject of chapter 3. Here the main group atoms are considered as part of the cluster framework (or are in interstitial sites) rather than as ligands. This is probably the weakest chapter of the book, many of the metal-rich (capped and bridged clusters and those with interstitial atoms) species having already been mentioned in the previous chapter.

Chapter 4 deals with the wealth of various types of clusters formed by the main group elements. There are sections on alkyl-lithium clusters, polyhedral boranes and carbaboranes, fullerenes, and their derivatives, Group 15 cage compounds, Zintl anions and homopolyatomic cations. The chapter is a good overview

of a vast field of research, with the section on fullerenes and solid state fullerides being particularly readable. I was, however, somewhat mystified to find the discussion of boranes and carbaboranes as a subsection of alkali metal clusters.

The final chapter is a discussion of synthetic iron-sulfur clusters and their relation to redox active sites in iron-sulfur proteins. This chapter is rather short and I feel somewhat out of place given the size and generality of chapters 2 and 4. In my opinion it would fit in quite well at the end of chapter 3 or combined with the final section of chapter 2 (catalysis by clusters) in a chapter on applications of clusters.

I have mixed views concerning the editing and production of this book. On the positive side, it is well referenced, the index is good, and the figures (mostly reproduced from the original literature) are well presented. On the negative side there is a certain amount of repetition and some topics are presented in a peculiar order, most notably the theoretical treatment of electron-deficient borane clusters which is given in the chapter on transition metal clusters and which precedes the chapter on main group clusters. There are quite a lot of typographical errors, many grammatical errors, and a number of tortuous sentences which adversely affect the readability of the book.

Overall, despite the criticisms listed above, I found this book to be a thorough treatment of a topical field which will be of interest to many inorganic chemists. The fact that it is in a single volume and that it is written by a single author, rather than being a collection of independently written reviews, coupled with the breadth of its coverage, should make this book of considerable use for teaching inorganic cluster chemistry and as such it should find its way into most chemistry libraries. It will also be useful as a reference text for postgraduates working in cluster chemistry, who should not find it prohibitively expensive.

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