
Book reviews

Organometallic Ion Chemistry

Ben S. Freiser (Ed.)

Kluwer Academic Publishers, Dordrecht, 1996

352 pages. £128.00

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Gas-phase metal ion chemistry has been the subject of intense research activity over the past two decades. Following the early experiments of Allison and Ridge on metal ion insertion, and Beauchamp and co-workers on the ion/dipole mechanism, the field has matured to a point where experimentalists now have control over the kinetic and potential (electronic-state) energy of an ion. These important developments have been matched by the ability of theorists to treat many-electron systems, and provide a quantitative understanding of the role low-lying electronic states play in structure and reactivity.

The review articles brought together in this book embrace all the most recent developments in theory and experiment. Articles by Armentrout and Kickel, van Koppen *et al.* and Russell *et al.* discuss the current state of transition-metal ion reactivity, and provide numerous case studies of the influence that changes in metallic electronic state have on chemistry. The power of recent advances in instrumentation is demonstrated through three examples: Armentrout and Kickel show how guided ion-beam techniques can be used to control reaction kinetic energy, van Koppen *et al.* discuss the use of ion chromatography to identify and select specific transition-metal atomic electronic states, and Russell *et al.* show how FTICR (Fourier Transform Ion Cyclotron Resonance) can be used to store ions and study their reactivity over extended periods of time. These three chapters are well complemented by reviews from Bauschlicher *et al.*, and Harrison and Kunze. Their articles cover recent theoretical studies of structure and bonding in small metal ion-molecule and radical complexes. *Ab initio* methods for the treatment of metallic systems have now reached a stage where they can be used with confidence both to verify and to predict the outcome of an experiment.

The range of reaction mechanisms afforded by metal ion-large molecule complexes is surveyed in an article by Eller. The work provides a good demonstration of how early ideas behind the interpretation of some of the very first experiments in the field can be verified and developed using modern experimental techniques. Photochemical studies of metal ion-molecule complexes are given comprehensive coverage in a chapter by Ranasinghe *et al.* Once again the power of FTICR is demonstrated as a technique for trapping and interrogating ions. However, in many respects photochemistry is one of the least developed of the research topics, in that

systematic studies are hampered by the need in every case for a suitable chromophore. Recent advances in tunable laser sources will most certainly open new opportunities for research in this area. In the final chapter, Richardson provides a detailed summary of our current understanding of electron-transfer equilibria in organometallic systems. This work seeks to find a link between the ionization energies and electron affinities of isolated systems, and redox potentials of bulk analogues. One of the most exciting extensions of this topic, and many of the others discussed in the book, has to be the application of experiment and theory to the study of multiply charged metallic complexes.

A final bonus to the book is the presence of a very comprehensive listing of metal-ligand bond dissociation energies. The editor, Ben Freiser, is to be congratulated for bringing together an excellent series of reviews written by acknowledged experts in their field.

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Organic Reactions in Aqueous Media

Chao-Jun Li and Tak-Hang Chan

Wiley-Interscience, New York, 1997

199 pages. £50

ISBN 0-471-16395-3

This book has been jointly written by C.-J. Li, an Assistant Professor of Chemistry at Tulane University, and T.-H. Chan, a Professor of Chemistry and Vice-Principal at McGill University. With the current attitudes to cost, safety and the environment, and the potential advantages of performing organic reactions in water, it is perhaps surprising that such a book has not appeared before now. It is certainly a welcome addition.

The text is presented in seven chapters, starting with a brief introduction to the important issues that should be considered when using water as a reaction solvent, such as the fundamental properties of water, the hydrophobic effect and salt effects. The remaining chapters cover pericyclic reactions, nucleophilic additions and substitutions, metal-mediated and transition-metal-catalysed