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Book review

Gas Phase Inorganic Chemistry; edited by D.H. Russell, Plenum Press, New York, 412 pages, $79.50 in Canada and U.S.A., $95.40 elsewhere. ISBN 0-306-42972-1.

Given the present trends in gas phase chemistry, it is perhaps not unexpected for a book on Gas Phase Inorganic Chemistry to devote at least half of its chapters to work on or related to clusters. An excellent summary is presented by Jarrold of the techniques available for generating metal clusters and for studying the reactions of their ions with small molecules. Unfortunately, some of the material presented overlaps slightly with that included in the chapter by Buckner and Freiser on the chemistry and photochemistry of bare metal cluster ions. However, the latter authors discuss a much broader range of reactions than those considered by Jarrold. Both of the above are complemented quite well by a chapter from Armentrout, where the reactions of atomic metal ions are discussed. In terms of the chemistry, atomic metal ions appear to be far more reactive than their cluster counterparts. There are several examples where cluster growth is accompanied by a reduction in the range of reaction products. Such specificity could be the key to a good catalyst.

Moving away from the reactions of bare metal clusters, much of the remaining chemistry appears to be dominated by organometallic complexes, and in particular, metal carbonyls. A chapter by Squires and Lane discusses the negative ion chemistry of a range of transition metal carbonyls, as does the chapter by Ridge and Meckstroth. The positive ion side to the picture is provided in chapters by Russell et al. and MacMillan and Gross, with the latter concentrating on tandam mass spectrometric studies of fragmentation following collisional activation. Three chapters discuss the photodissociation of metal-containing gas phase ions: Dunbar covers a broad range of topics from metal carbonyls through to bare metal clusters, and the chapter presents a very useful compendium of optimum photodissociation wavelengths; Vaida summarizes recent developments in the use of multiphoton ionization techniques to study metal carbonyls; and Weiller and Grant discuss the results from time-resolved infrared photodissociation studies of metal carbonyls. To complete the picture, a chapter by Lichtenberger and Kellogg covers the use of photoelectron techniques to characterise metal carbonyl compounds.

A cursory look at the book suggests that gas phase inorganic chemistry is dominated by two areas of chemistry, viz. the reactions of bare metal clusters and those of metal carbonyls, and that they have been brought together by a single physical property, namely most of the reactants are ionic. The distinction between studying the reactions of neutral molecules or their ionic counterparts is one primarily of experimental convenience, in that it is far easier to control and identify both ionic reactants and their ionic products. Having said that, the state of affairs regarding the chemical and physical properties of neutral metal clusters is nicely summarised in a chapter by Whetten and Schriver. In terms of detailed chemistry it

is evident, however, that there is still a long way to go before we begin to talk of reactions on neutral metal clusters of a specific size and constitution.

The balance of material presented in the book could be taken as a reflection, not only of present activity, but also of future trends; as an outsider looking in, I would have to admit that I find the prospect of studying the reactions of bare metal clusters quite an exciting one.

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