

Book reviews

Chemistry of Complex Equilibria, by M.T. Beck and I. Nagypal, Ellis Horwood Series in Inorganic Chemistry, Chichester, 1990, \$93.50, translated by D.A. Durham. ISBN 13-173063-0.

This is an interesting volume which has its origins in a previous book by M.T. Beck published in 1969. The new edition attempts to provide a unified treatment of all types of complex equilibria based on results available over the past 20 years. Implicit in the approach is the intention to reveal the chemistry often remaining hidden behind the algebraic equations.

After a short introductory chapter which is akin to a history lesson in this field, there are two chapters dealing with complex equilibria, equilibrium constants and the characterisation of complex equilibrium systems. These are well designed and provide valuable insights into the methods of computation for multicomponent and polynuclear systems. The reader is provided with examples of differing reaction types with the attendant mathematical considerations fully provided. A chapter on experimental methods follows which is fully documented and is complemented by the following chapter on methods (including computer driven) of evaluation of the experimental data. Again, the treatment is comprehensive and is described clearly. The book changes character in the last chapter with detailed accounts of topics such as solvation, the chelate effect, microconstants and the role of ionic strength and medium as “external” factors in complex formation. Although the main thrust of the book is algebraic with chemical examples, the reader is left with the impression of the authors attempting in the last chapter to provide a recognisably stronger chemical theme.

Perhaps the most disconcerting aspect of the book is the lack of any really up-to-date context. Although published in 1990, this volume could have been available a decade ago since considerably less than ten percent of the references are post-1980! While the acquisition of equilibrium data may not be as fashionable and the stuff of successful research grant applications, there is nevertheless much activity in this area with the development of biological analogues, macrocyclic π - and σ -bonded systems, tertiary complex formation and the roles of solvent, pressure and ionic media (the latter areas described, but only in a sketchy manner). There are also themes where the authors may relate too much to the potential of the method and omit other fruitful approaches. It is asserted (p. 141) that “NMR can be used effectively to solve almost all equilibrium chemistry problems”. There is no doubt that unambiguous speciation may be forthcoming, but there are also problems of concen-

tration, polynuclear formation and paramagnetic broadening which should be considered. Also, in relation to ESR, the question of dielectric loss in aqueous studies is not discussed. On the other hand, details of calorimetric studies and the technical difficulties in the evaluation of K using specific ion electrodes are well defined. An important omission is the increased use of rapid reaction kinetic systems (including flow ESR and NMR) in the study of the formation of ligated species. There is some discussion of reactions of coordinated ligands, but no mention of techniques which can provide equilibrium data on complexes in the sub-second lifetime range.

Equilibrium conditions of outer-sphere complexes are described with little discussion of the reactivity of inner-sphere systems. There is also the curious statement (p. 366) that the decline in publications over the past decade in the area of outer-sphere complex formation is probably due to the fact that the "fundamental questions were solved in the 1960s while the theoretical knowledge for a detailed analysis is still not available". One has to wonder at the work over the last ten years by Hush, Sutin and others on the Marcus Model of electron transfer where the whole question of precursor complex formation has been so prominent. The nature of photochemical charge transfer processes occurring in outer-sphere systems is also an area which appears to be omitted. It may not have been the intention of the authors to examine such topics. However, after a glimpse of the interesting overview provided by detailed knowledge of equilibrium data in, for example, the analysis of the chelate effect, the very short "prospects" chapter while pointing to future study areas fails to convey a sense of excitement or curiosity. Let us hope that the challenges ahead in this area of chemistry are not subsumed in other wider investigations. There is a need for analytical treatment of equilibria. This volume certainly provides details on the acquisition and data handling in evaluating constants. It is unfortunate that the account could not have been more contemporary.

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Bonding Energies in Organometallic Compounds, ACS Symposium Series No. 428, edited by Tobin J. Marks, American Chemical Society, Washington, DC, 1990.

This book is a series of 18 presentations following an introductory overview by the editor. It is based on the September 1989 symposium at the 198th National Meeting of the American Chemical Society, and is aimed at a wide audience, including surface and catalysis chemists and biochemists. Each presentation (chapter) is self-contained with references up to the first part of 1989. There are also overall author, affiliation and subject indexes.