

Book review

PROGRESS IN INORGANIC CHEMISTRY, Volume 25, S. J. Lippard, ed., John Wiley and Sons, Inc., New York/Chichester, 1979, 350 pp., \$29.95

Inorganic chemistry encompasses every element of the Periodic Table, and so a volume of a series which annually surveys progress in this field might be expected to bring a diversity of topics. Such is the case with the present book which contains four reviews: "X-Ray Absorption Spectroscopy: A New Structural Method and its Applications to Bioinorganic Chemistry", by S. P. Cramer and K. O. Hodgson (40 pages); "Aspects of the Stereochemistry of Seven-Coordination", by D. L. Kepert (104 pages); "The Hydrido-Transition Metal Cluster Complexes", by A. P. Humphries and H. D. Kaesz (78 pages) and "Chemistry and Spectroscopy of f-Element Organometallics. Part II. The Actinides", by T. J. Marks (111 pages).

For the organometallic chemist, Marks' continuation of his survey of the organometallic chemistry of the f-elements (begun in Vol. 24 of this series with a fine chapter on lanthanide organometallics) will be of greatest interest. The field of actinide organometallics, which began only in 1956 with the preparation of $(C_5H_5)_3UCl$, after a somewhat slow start, has blossomed in the last ten years. This review comes at just the right time: the major possible types of actinide organometallics appear now to have been discovered and a new era, in which the focus will be on their applications in synthesis and, especially, their utilization in important catalytic processes, is now commencing.

After a useful introduction on the general properties of actinide ions, the known actinide organometallics are discussed according to the ligands they contain: allyls, cyclopentadienyls, arenes, σ -bonded groups, hydrides, cyclooctatetraenyls and various others. Finally, there is a section on their use in organic synthesis and catalysis, a topic which is as yet in its early stages. The discussions cover all bases with great expertise: synthesis, chemistry, spectroscopy, and structure and bonding. This is a fascinating but difficult area of research: even if the actinide complex is thermally stable, it invariably is highly air- and/or moisture-sensitive. The radioactivity of the central metal, if sufficiently high, leads to further inter-

esting and unique properties; where else in organometallic chemistry can one find a compound which, like tris(cyclopentadienyl) americium, glows in the dark?

Transition metal cluster complexes are the subject of another currently very active area of transition metal research, in which the question "Is the cluster really the catalyst?" is an important but vexing and hard-to-answer one. When the cluster complex contains terminal or bridging hydrogen ligands, the chemistry becomes more diverse and interesting, as, for instance, the fascinating reactions of $\text{H}_2\text{Os}_3(\text{CO})_{10}$ have shown. Humphries and Kaesz have done a fine job of presenting what is known about the synthesis and chemistry of hydrido-cluster complexes in a review that is organized systematically and written well and clearly. An index of the known hydrido-metal cluster complexes which is organized according to cluster framework and provides proton NMR data is a useful feature of this chapter.

Keper's review on seven-coordination extends his reviews in previous volumes of this series on six- and eight-coordination. As the author states in his introduction, "The geometry of seven-coordinate complexes is not simple, and some effort is required even to just begin to understand this subject". As in the previous reviews, the subject is presented clearly and thoroughly. This chapter will be of interest and utility to some organometallic chemists, but much more so to coordination chemists.

The chapter by Cramer and Hodgson introduces the "new face" of X-ray absorption spectroscopy. The revitalization of this subject is a result of advances in methodology and in the theory of extended X-ray absorption fine structure, and these are discussed in detail. This powerful technique can provide information concerning the electronic structure, the oxidation state and the site symmetry of a metal atom and thus is particularly well adapted (in some cases uniquely) to a study of metal sites in biological molecules. A number of such applications are described. This chapter provides a good introduction to a useful new technique, and it should be of interest to all inorganic chemists.

The editor of this volume is to be commended for a good choice of topics and two fine additions to the organometallic review literature.

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