

Book review

"Transition Metal Organometallics in Organic Synthesis," Vol. 1, H. Alper (Editor), Academic Press, Inc., New York/San Francisco/London, 1976, ix + 258 pages, \$ 26.50.

This book, the first of a planned two volume set, contains three chapters entitled "Transition Metal Complexes of Olefinic Compounds," by A.J. Birch and I.D. Jenkins, "Coupling Reactions via Transition Metal Complexes" by R. Noyori, and "Metal Carbene Complexes in Organic Synthesis" by C.P. Casey. The first chapter covers the major uses and reactions of synthetic interest of metal-olefin complexes, including C–C and C–X bond formation by nucleophilic or electrophilic attack on metal-bound olefins, double bond isomerizations, stabilization of normally unstable intermediates (particularly cyclobutadiene) by complexation, use of transition metals for protecting, activating, and directing olefin reactions, and finally rearrangement reactions and stereochemical considerations. The coverage of these topics is far from encyclopedic. Rather, a few examples of each type of process are presented as examples, and critically discussed. Published mechanistic schemes are often reinterpreted in view of more current information, and a critical assessment of synthetic utility is presented. In addition, the authors offer suggestions as to what potential but as yet unreported synthetic uses these complexes can be put. This chapter provides an excellent, brief, critical overview of the field with sufficient documentation for readers desiring a more thorough treatment.

The second chapter discusses coupling reactions of σ - and π -bonded organic ligands, displacement reactions with transition metal complexes, nucleophilic reactions of organotransition metal complexes, electrophilic reactions of organopalladium complexes, addition reactions of organometallics across unsaturated carbon–carbon bonds, and carbonylation reactions. While there is some overlap with topics treated in Chapter 1, this material is really complementary rather than repetitive. In contrast to the first chapter, coverage is relatively complete, with an in-depth presentation of most significant results through 1975. This chapter presents an especially pertinent treatment of several types of reactions of major significance for natural product synthesis, including organocuprate alkylations and conjugate additions, the use of π -allylnickel halides, and disodium tetracarbonyl ferrate in synthesis, alkylations of π -allylpalladium complexes, and synthesis of bridged polycyclic systems using iron carbonyl complexes. Many specific syntheses of naturally occurring compounds involving these methods are presented in detail, and having this wide variety of methods presented in a single review allows comparisons to be made easily.

The final chapter is very different from the first two in that it discusses a class of compounds (metal carbenes) of great potential but little accomplished application in organic synthesis. Structure and bonding considerations and direct synthetic approaches to metal-carbene complexes are presented, along with methods

for elaboration of carbene ligands, and procedures for release of the carbene ligand from the metal. Since metal-carbene complexes have found little use in organic synthesis to date, the material contained in this chapter is of greater use to those interested in developing new synthetic methods, than to those interested in using existing methods for total synthesis. It should certainly provoke additional research in this area.

Overall, this book is a valuable source of information for the specialist and nonspecialist alike. It is very well written and enjoyable to read, a rarity among chemistry monographs.

*Department of Chemistry,
Colorado State University,
Fort Collins, Colorado 80502 (U.S.A.)*

LOUIS S. HEGEDUS