

Book Review

P. ANDREW EVANS

Modern rhodium-catalyzed organic reactions

Wiley-VCH; 2005,

496 pp; £105.00/€157.50 (hardcover),

ISBN-10: 3-527-30683-8 (hardcover),

ISBN-13: 978-3-527-30683-1

This book, edited by P. Andrew Evans, provides one of the first attempts at comprehensive cover of the areas of application of rhodium catalysts for a wide range of synthetic transformations of interest to organic chemists. Directed towards graduate students and synthetic chemists at all levels in academia and industry, it represents an attempt to bring together and categorize, in a systematic and comprehensive manner, a very disparate collection of numerous rhodium-catalysed organic reactions, with considerable emphasis on asymmetric catalysis, grouped under 19 topics.

This multi-author compilation has been collected into 19 chapters, each of which has been written by experts appropriate to the area. In chronological order these chapters cover: asymmetric hydrogenation (Y. Chi, W. Tang and X. Zhang); hydroboration and related reactions (J. M. Brown); asymmetric addition of organometallic reagents to electron-deficient olefins (K. Yoshida and T. Hayashi); asymmetric olefin isomerization and hydroacylation (G. C. Fu); stereoselective hydroformylation and silylformylation (J. L. Leighton); C–C bond-forming reactions starting from Rh–H or Rh–Si species (I. Matsuda); cycloisomerization and cyclotrimerization (M. Fujiwara and I. Ojima); the Alder-Ene reaction (K. M. Brummond and J. M. McCabe); nucleophilic ring-cleaving reactions of allylic ethers and amines (K. Fagnou); allylic substitution and applications in target-directed synthesis (D. K. Leahy and P. A. Evans); [2 + 2 + 1] and [4 + 1] carbocyclization reactions (N. Jeong); [4 + 2] and [4 + 2 + 2] carbocyclizations (J. E. Robinson); [5 + 2], [6 + 2] and [5 + 2 + 1] cycloadditions (P. A.

Wender, G. G. Gamber and T. J. Williams); Rh(II)-stabilized carbenoids containing both donor and acceptor substituents (H. M. L. Davies and A. M. Walji); asymmetric cyclopropanation and carbon–hydrogen insertion (M. P. Doyle); intramolecular C–H insertion for the construction of cyclopentanes (D. F. Taber and P. V. Joshi); oxidative amination (C. G. Espino and J. Du Bois); rearrangement processes of oxonium and ammonium ylides via carbene transfer (F. G. West); and finally 1,3-dipolar cycloaddition reactions (R. M. Savitzky and D. J. Austin). Although not exhaustive, the coverage does provide an excellent perspective on the enormous and wide-ranging activity associated with the application of rhodium catalysis in synthetic organic chemistry.

The book is well-written and presented, with few typographical errors evident. Minor points noted, particularly in the chapter on asymmetric hydrogenation but also elsewhere, include the incorrect reference to phosphorus ligands as ‘phosphorous’. In the chapter on stereoselective hydroformylation and silylformylation a seemingly random use of a variety of pressure units is evident, e.g. atm, bar, kg/cm² and psi, and in one example (Scheme 5.20) three of these are used in consecutive entries(!). This seems likely to be a source of unnecessary confusion to those readers who are unfamiliar with the various units of pressure in common parlance. With one or two exceptions the chapters are written in a uniform, user-friendly style although it would have made editorial sense to unify the ‘summary’ and/or ‘conclusion’ titles at the end of each contribution. The book contains an excellent, comprehensive index, which represents a refreshing change from many similar texts of this genre and such attention to detail is to be applauded.

Although chiral phosphorus ligands are considered in detail in the first chapter and some of this information is duplicated in subsequent chapters, one glaring omission, for a book entitled ‘Modern Rhodium-catalyzed Organic Reactions’, is the absence of any reference whatso-

ever to the fundamental organometallic chemistry associated with the wide range of potential rhodium catalyst precursors. Although the Wilkinson–Coffey complex RhCl(PPh₃)₃ frequently features as a traditional and convenient rhodium source, numerous other rhodium complexes have been used in much of the work described throughout the volume. Variation in the nature of the precursor can lead to significantly different effects in terms of chemo-, regio- and stereoselectivity in organic transformations. A brief overview of such information, together with details of availability, suitability and costs—particularly apposite to the industrial manufacturers of fine chemicals and pharmaceuticals (also the costs associated with the use of chiral phosphorus-based ligands where required)—of different source materials, would have been invaluable to organic chemists irrespective of whether they are already active, or about to embark, on the use of rhodium-containing catalysts in the types of transformations described in this book; the lack of such information represents a serious omission on the part of the Editor.

The above reservations apart, this book provides, in one volume, a detailed account of the range of current methodologies and applications in organic synthesis that are available using rhodium catalysts. It should therefore serve not only as an excellent reference text but also as an excellent source of ideas from which to develop further the ever-widening subject of rhodium catalysis by the practitioners of synthetic organic chemistry. Finally, the asking price of £105.00 (€157.50) for a volume of this sort seems entirely reasonable in present-day terms.

Robin Whyman

Department of Chemistry, University of
Liverpool, UK

DOI:10.1002/aoc.989