

## Book review

*Palladium Reagents and Catalysts: Innovation on Organic Synthesis*, Jiro Tsuji, Wiley, Chichester, 1995, xiii + 560 pages, £125 ISBN 0-471-95483-7

This book, written by an acknowledged expert in the field, gives an up-to-date coverage of the wide range of organic reactions which are promoted by palladium reagents. This is an outstanding volume and is a particularly timely addition to the other excellent books and review articles in the field.

Chapter 1 gives some idea of the basic chemical reactions of palladium and includes some thoughtful practical notes regarding types of catalyst, ligand effects and aggregation issues. The style of writing is extremely accessible but at the same time thought provoking. For example oxidative addition is a process which most organic chemists meet first in the preparation of a Grignard reagent, and the comparison of carbon–palladium bonds with carbon–magnesium bonds is helpful and is used several times throughout to explain reactivity and catalysts. In the context of explaining oxidative addition the author points out Pd(0) can “oxidised” to Pd(II) hydride by hydrogen; I am sure that (most) organic chemists would not consider hydrogen to be an oxidising agent! The discussion of fundamental reactions is completed by illustrating how catalysis using palladium reagents is possible.

In a very short second chapter there is a presentation on the classification used in the book; not only is this helpful but it also serves to whet the appetite and give a taste of what is to come.

Chapter 3 is the first major chapter in the book and concentrates on oxidative reactions with palladium(II). This is an excellent place to start, and inevitably the Wacker oxidation is a highlight here. Some of the superb reactions of alkenes receive considerable attention, and a variety of reactions with a range of nucleophiles (O, N, S, etc.) are covered. This chapter also includes stoichiometric reactions of  $\pi$ -allyl complexes, reactions of conjugated dienes, aromatic compounds

and a range of aspects associated with transmetallation. The section on heteroatom chelation is excellent, and Holton’s superb approach to Narwedine is a real highlight.

Chapter 4 concentrates on catalysis with Pd(0) and Pd(II) and, as expected, this is the largest chapter in the book. The reactions of organic halides and pseudohalides are covered in a large section highlighting, of course, the so-called Heck reaction, and a very nice sub-section on organometallic species highlights Grignard, zinc and lithium reagents. Of particular note is the reiteration of the  $\beta$ -hydride elimination problem; Suzuki’s excellent work on cross-coupling of alkyls is, of course, extremely important in this regard.

There are also a large number of cross-coupling reactions included which utilise the ubiquitous tin reagents. This chapter then moves on to a hefty discussion of  $\pi$ -allyl palladium compounds and their synthetic utility; this section also includes a nice introduction to mechanism, which serves to illustrate the opportunities which exist for stereocontrolled synthesis. The chapter concentrates, in the main, on the use of soft nucleophiles, although there is some invaluable information on using hard nucleophiles for some interesting transformations. This chapter then moves on to give detailed analysis of reactions of conjugated dienes, allenes, alkenes and alkynes; the Pd-catalysed zipper reaction developed by Trost is an excellent example of the synthetic potential of these addition reactions.

The book is completed with a short chapter on a range of reactions, including exchange, cope rearrangement, decarbonylation and reduction.

Overall this book is very well produced, free of major errors, and has a vast number of key references (for example, Chapter 4 has over 780). Although these are important attributes, the most appealing feature of the book is the style in which the information is presented. The author has clearly spent considerable time considering how to construct each chapter, which usually begins with an informative, thoughtful introductory

section to set the scene which newcomers to the field will find invaluable. The author's clear interest in organic synthesis is apparent, and many of the most interesting examples are taken from natural product synthesis. The numerous aspects of stereoselectivity which have been the subject of great research effort are also highlighted throughout. The book is easy to read from cover to cover or to dip into, and there is a wealth of exciting chemistry covered. In my view the book is

essential for all chemistry libraries and synthesis laboratories.

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