

Organometallic Chemistry of Palladium

Palladium Reagents in Organic Syntheses, Best Synthetic Methods

BY RICHARD F. HECK, Academic Press, London and New York, 1985, 461 pages, £85/U.S. \$99

This is one of a new series of books designed to provide working details of methods which can be applied to the synthesis of organic compounds by the practising organic chemist. The book is not comprehensive but it does include all of the palladium-promoted reactions reported in the literature up to 1983 which are relevant to organic synthesis. In all 509 references are given. In the Detailed Contents, the subject matter of each chapter is itemised, and this arrangement together with an index of compounds and methods enables topics of interest to be located readily.

The opening chapter provides details of the preparation of palladium reagents and also of the recovery of the metal, and it is particularly helpful that procedures are given for the preparation of representative complexes. It is noted that while the initial cost of palladium is high (although comparable with many other organic reagents) the metal can be readily recovered and is therefore reusable. Thus the use of stoichiometric rather than catalytic amounts of palladium can be viable in particular reactions.

A very wide range of organic transformations are catalysed by palladium species and a chapter is devoted to each of the following topics: double bond isomerisation; palladium-catalysed molecular rearrangements; palladium-catalysed oxidation of alkenes, alkynes, benzylic carbons, carbonyl compounds and alcohols; palladium-assisted substitution and elimination reactions at allylic carbons; palladium-assisted couplings of aryl, alkenyl, allyl and alkyl derivatives; palladium-assisted dimerisations and oligomerisations of alkenes, dienes and alkynes; palladium-catalysed carbonylations and decarbonylations; palladium-promoted cyclopropanations, and catalytic reduction by hydrogen transfer and related reactions.

The book is well-laid out and the 172 tables neatly summarise a vast quantity of information. These tables indicate reaction conditions and yields and provide references for specific transformations and are therefore particularly useful as a working aid. It is helpful that the author, who has a wealth of experience in the area of the organic chemistry of palladium, offers opinions on the usefulness of palladium in specific reaction types. Examples include: "With a few exceptions palladium and its complexes are not good double bond isomerisation catalysts" and "Not only do many of these catalytic rearrangements (sic sigmatropic rearrangements) occur under much milder conditions with the metal catalyst . . . but the reactions often occur in significantly higher yield and in some cases gave different products". These comments are helpful in deciding the relative merits of a particular reaction pathway.

It would also, however, have been beneficial to refer the reader to the treatise by B. M. Trost and T. R. Verhoeven entitled "Organopalladium Compounds in Organic Synthesis and in Catalysis", to be found in Volume 8 of "Comprehensive Organometallic Chemistry" (editor G. Wilkinson) published in 1982 by Pergamon Press, as the two texts are complementary.

Since this series is directed at practising chemists and ideally should be found in organic chemical laboratories it would be advantageous if the publishers could bring out a paperback version at a reduced price. This would do much to ensure that the remarkable catalytic properties of palladium become more widely used for the synthesis of novel organic molecules, thus realising the author's expressed desire to "help organic chemists to simplify many organic syntheses with a significant saving of time, effort, and energy".

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