APPLIED ORGANOMETALLIC CHEMISTRY
Appl. Organometal. Chem. 2006; **20**: 719
Published online in Wiley InterScience
(www.interscience.wiley.com)

Book Review

TAKESHI TAKEDA (EDITOR)

Modern carbonyl olefination: methods and applications

Wiley-VCH, 2004,
365 pp; price £105.00/157.50 Euros
ISBN 3-527-30634-X (hardcover)

In 1953, Georg Wittig discovered that phosphorus ylides react with aldehydes and ketones to form alkenes—a discovery for which he was later rewarded with a share of the 1979 Nobel Prize. The reaction that bears his name is one of the first olefination methods introduced to us as undergraduate chemistry students and its many virtues are extolled—its complete regioselectivity, its moderate to good stereoselectivity and its successful application in the synthesis of strained alkenes.

It is only a little later in our chemical education, perhaps when we first carry one out in the laboratory, that we become aware of some of the limitations of the Wittig reaction, such as its relatively limited substrate scope, its poor atom economy, and the difficulties that can be encountered in separating our alkene product from large amounts of triphenylphosphine oxide.

While the Wittig reaction and its relatives are still among the most widely used methods for converting a C═O into a C═C group, a huge amount of research over the last 40 years has been devoted to the development of other methods for this conversion that extend the scope of, or otherwise complement, Wittig technology. This book brings together a series of seven articles reviewing the methods that are now available for this key organic transformation. The first three reviews focus on main-group olefination methods; these are followed by three on transition metal-mediated processes. The final article details progress in the field of asymmetric carbonyl olefination.

In the opening chapter, entitled 'The Wittig Reaction', not only the title reaction, but its relatives such as the Horner–Wadsworth–Emmons reaction of phosphonates and the Horner–Wittig reaction of phosphine oxides, are briefly summarized. Wisely, in view of the breadth and relative familiarity of the subject, the authors choose not to give copious literature examples, but instead focus on the factors influencing stereo-selectivity in these reactions and the current understanding of their mechanisms.

The bulk of the book is taken up by the next five chapters, which cover respectively the Peterson and Julia methods, the use of metal–carbene complexes, zinc- and chromium-mediated methods, and the McMurry coupling. All of the most well-known and widely used olefination methods are described in detail, as are numerous methods that have not yet become part of the standard synthetic arsenal. All of the chapter authors have achieved an excellent balance between delineating the scope of the reactions (both in terms of substrates that can be employed and products that can be accessed), describing the various experimental protocols that are available, and discussing the mechanisms of the different olefination procedures.

We come full circle for the final chapter, which returns to the Wittig and Horner–Wadsworth–Emmons reactions, but in the context of asymmetric carbonyl olefination. Desymmetrization of *meso*-dicarbonyl compounds, the generation of axially chiral alkenes from achiral 4-substituted cyclohexanones, and kinetic resolution of racemic ketones are covered in depth. While some impressive results have been obtained in these reactions, this is still clearly a fledgeling area of research. In highlighting the current limitations and pointing towards possible future areas of development, this chapter provides a fitting end to the book.

The book as a whole has been carefully edited to give a remarkably consistent style, and very few typographical errors appear. The indexing is of a high standard, so finding methods for the preparation of a particular class of compounds, or an overview of the use of a particular reagent, is very easy.

Overall, this book is clearly aimed at the practising synthetic chemist and, while it is not a volume to be read cover-to-cover, each chapter provides an excellent summary of a particular olefination method. Given the ubiquitousness of the transformation, this book will provide a useful reference work for anyone involved in organic synthesis.

Mike Porter
Department of Chemistry,
University College London, UK

DOI:10.1002/aoc.1112

Copyright © 2006 John Wiley & Sons, Ltd.

WILEY InterScience® DISCOVER SOMETHING GREAT