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Book reviews

Stereoselectivity in synthesis

T.-L. Ho
Wiley-Interscience, New York, 1999
xv + 333 pages. £61.50
ISBN 0-471-32922-3

Professor Ho, a writer of several reviews and books, has supplemented his output with this text on the important topic of stereoselectivity in organic synthesis.

The book begins with a rather breathless presentation of 'Some fundamental concepts', which do not subsequently feature greatly, and the tempo relents only slightly in the other eight chapters. In these subsequent chapters the topics dealt with include 1,2- and 1,3- and more remote stereoinduction, group-directed reactions, and the effects of chelation, conformation, topography and templates. The book finishes with two chapters on steric, electrostatic and stereoelectronic effects, and thermodynamic control and kinetic trapping.

At the start of Chapter 2 (1,2-stereoinduction) the author writes, in respect of diastereoisomeric transition states, '… the reaction will proceed from the one with the lower activation energy, with the product distribution profile depending on the energy difference'. Now, the reaction does not proceed *from* a transition state but *via* a transition state. Any preference for one product or the other in a kinetically controlled reaction is introduced on the pathway to the transition states from starting material. Further, it is not stated whether the energy difference referred to relates to transition states or products, although from the context of the chapter, one takes it to be the former.

The book contains an impressive collation of material and seems to be essentially free of errors. The diagrams are lucid.

Although it is not entirely clear, one surmises that the target readership would be research workers who are academically inclined. It is difficult to feel that this book will be a self-contained text from which to learn about stereoselective synthesis. In several instances, apprentices in the subject will be left scratching their heads as explanations of reactions are not given in their entirety. To quote a couple of examples: the treatment of Enders' powerful and well-used RAMP and SAMP reagents (page 96) is perfunctory. In respect of the asymmetric aldol reaction (page 29), a condensed survey that is probably insufficiently detailed finishes with: 'The results agree with the Zimmerman–Traxler transition state model quite well'. The Z–T model, however, is neither explained nor referenced.

Fortunately, the text is generally well referenced with a list of over 1050 references, although few are later than 1995. These references will provide a valuable conduit to the original literature.

By this Herculean collation of reactions, Professor Ho has provided a signal service and research workers in this field will either wish to purchase this book or to have ready access to a copy.

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Synthetic methods of organometallic and inorganic chemistry: Transition metals Part 3

Wolfgang A. Herrmann (ed.)
Georg Thieme Verlag, Stuttgart, 2000
221 pages. DM 198
ISBN 3-13-115141-2

This book, volume 9 in a ten volume series, and the third volume to be devoted to the transition metals, contains detailed procedures for the preparation of a wide selection of organometallic compounds of importance to homogeneous catalysis. The present volume concentrates largely on developments that have been made in the last 10 years and topics such as water-soluble transition metal complexes containing the sulfonated triphenylphosphine ligand (TPPTS) are prominent. The team of contributors assembled by the editor provide a wide coverage of the subject matter and an enormous range of chemistry is briefly touched on. As a consequence, all organometallic chemists working at the bench are likely to finding something of interest in these pages.

The book is organized into seven chapters, with the most substantial being the first on alkenyl, allyl and dienyl complexes. In addition to describing the detailed preparation of individual transition metal complexes, this chapter also provides a brief overview of the synthetic strategies that can be applied to their syntheses, and describes methods for the synthesis of the main group organometallic precursors used in the preparation of the transition metal derivatives. The second chapter deals with complexes of π-bound heterocyclic ligands, and

pyrrolyl, phospholyl and borolyl derivatives all receive good coverage, though I was surprised that there were no examples of the increasingly common π-thiophene derivatives. In the last 10 years there has been a great surge in interest in carbenes derived from imidazoles, pyrazoles and triazoles, and this is reflected in the chapter on *N*-heterocyclic carbenes by Herrmann, Kohl and Schwarz, which describes around three dozen complexes of these ligands with the late transition metals. Oxo and alkoxy complexes of the heavier Group 6 metals appear with great regularity in the chemical literature, and Chapter 4 collects together the syntheses of several important examples of these classes of compound and describes the formation of adducts of the oxyhalides by reaction with Lewis bases. Chapter 5 is probably of least use to the general synthetic organometallic chemist as it focuses very narrowly on the formation of highly reduced tantalum carbonyls. However, if this is an area the reader works in he will find the chapter valuable, as several of the preparations described here represent improvements over the current literature methods. Chapter 6 is devoted to derivatives of TPPTS. One of the most useful aspects of this chapter is the detailed description of the gel permeation chromatographic apparatus used to perform the separation of the sulfonated phosphines and their derivatives. The final chapter describes the preparation of a miscellaneous range of complexes, including the ubiquitous (allyl)-chloropalladium(II) dimer. However, the main emphasis is on alkylidene complexes used for the catalysis of olefin metathesis and other reactions, and on the *bis*(imido) complexes described by Gibson and Brookhart for α-olefin polymerisation.

In conclusion, there will be few organometallic chemists who do not find a number of complexes of interest in this volume. In addition there are also many useful references to the primary literature, both in terms of the original preparations and the applications of some of the compounds described in the volume. If one is to criticize the book it would be on the relatively trivial grounds of the inconsistent way in which the information on the synthesis and subsequent characterization is presented (an almost inevitable consequence of the substantial number of contributing authors) and the fact that a number of typographical errors have crept in to the manuscript. Otherwise the volume comes highly recommended for any laboratory heavily committed to research in synthetic or catalytic organometallic chemistry.

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Silicon in organic, organometallic and polymer chemistry

Michael A. Brook
John Wiley & Sons Ltd., Chichester, 2000
xxiv + 680 pages. £80.95
ISBN 0-471-19658-4

This book represents the first major text to treat silicon chemistry as a whole since Eaborn published his extensive invaluable coverage of the subject, *Organosilicon Compounds*, in 1960. It is to be expected, given the advances since that time, that the two books should fulfil rather different purposes. What is certain is that both will continue to serve those involved in silicon chemistry for some considerable time to come.

In his book the author has amazingly managed to give coverage to all major aspects of current interest in organosilicon chemistry. He comments that the focus here is on silicon compounds that are amenable to synthesis. Even within this constraint the level of coverage of different topics necessarily varies considerably. For example, there is a reasonably broad coverage of silicon reagents in organic synthesis, whereas coverage of amorphous silicas and their organically modified varieties is relatively concise.

The material in the book dealing with small-molecule chemistry is particularly skilfully presented, involving a gradual build up of carefully organized classes of compounds with successive chapters extensively cross-referenced to appropriate learning points (e.g. relating to bonding or mechanism) from previous chapters. Each chapter in the book is beautifully illustrated and extensively referenced.

In terms of organization, the material appears under three general themes, each further subdivided into chapters. Part 1 sets the scene regarding fundamentals in five chapters introducing the various classes of organosilicon compounds along with bonding models. This section includes an excellent account of the mechanistic features of substitution at silicon.

Part 2, in six chapters, focuses on silicon attached to atoms other than carbon, ranging from hydrogen to transition metals. Silyl protecting groups have seen extensive application in organic chemistry and thus feature prominently. One chapter is devoted to silicone chemistry, treating the complex features of synthesis and properties in relation to application. There is further discussion of topical issues relating to silicone implants in a later chapter. The coverage of other silicon polymers, such as polysilanes, polycarbosilanes and polysilazanes, is relatively concise but incorporates sufficient background, appropriate examples, and details of the limitations and applications of these polymers.

In Part 3, where the theme relates to silicon–carbon bonds, there is extensive coverage of routes leading to silicon–carbon bond formation in Chapter 12, followed in (the final) Chapter 16 by the reverse of this, namely strategies leading to silicon–carbon bond cleavage.