Lalande, algicide), and I disliked the left-justification of all equations and structural formulae, but overall this is a reasonably well-produced book which fills a gap.

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Lanthanides: Chemistry and Use in Organic Synthesis Topics in Organometallic Chemistry, Vol. 2

S. Kobayashi (ed.)

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307 pages. £69
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The use of lanthanides as catalysts and reagents in organic synthesis has moved on rapidly since the publication of Imamoto's book *Lanthanides in Organic Synthesis* in 1994, and so another book in the area is well justified. This is Volume 2 of the series *Topics in Organometallic Chemistry*, and is edited by Shu Kobayashi, who has made major contributions to the area of lanthanide Lewis acid catalysis in the last decade. The stated aim of the book is to give the reader an overview of recent developments in the area; these developments have been so rapid that many of the topics in the present volume do not appear in Imamoto's book.

The opening chapter, by Reiner Anwander, introduces the principles of organolanthanide chemistry; this review will be of particular use to organic chemists unfamiliar with the vagaries of organolanthanide chemistry. Readers who have seen the opening chapter of *Topics in Current Chemistry Vol. 179* (by Anwander and Herrmann) may spot some similarities!

Kobayashi has contributed two chapters on lanthanide triflates in catalysis. The first reviews a wide range of Lewis-acid-catalysed C–C bond formations, including reactions in aqueous solution, some examples of highly enantioselective reactions, and re-use of the catalysts. A separate chapter reviews recent work (mainly by Kobayashi) on the use of polymer-supported lanthanide triflates which should lead to simpler work-up procedures.

One of the most spectacular successes in enantioselective catalysis by lanthanide complexes is the heterometallic alkali-metal lanthanide tris(binaphtholate)s prepared by Shibasaki. The present volume contains a chapter by Shibasaki telling the story of these remarkable catalysts from the first application (the nitroaldol reaction in 1992), before the catalysts had been characterized, through the structural characterization of the complexes, to the more recent (1998) application to the Diels–Alder reaction. There have been significant advances since the publication of a review by Shibasaki in *Angewandte Chemie* in 1997.

Two chapters describe aspects of the one-electron reduction chemistry of lanthanide(II) complexes. SmI_2 (Kagan's reagent) was introduced over 20 years ago and has become an important and very versatile one-electron reducing agent in organic synthesis. Kagan and Namy review the influence of solvents and additives on the reactions mediated by SmI_2, a topic which, despite all that has been written on SmI_2, had not been reviewed previously. Ketone reduction is an important aspect of lanthanide(II) chemistry and a chapter by Hou and Wakatsuki describes recent advances in the area, including isolation of complexes containing ketyl and ketone dianion ligands, which give mechanistic insight into the course of important reactions such as pinacol couplings.

Metallocene complexes of the lanthanides are perhaps best known for their catalysis of polymerization reactions. Stereospecific polymerization of olefins, methacrylates and lactones by these complexes is reviewed in a chapter by Yasuda. The use of metallocenes in synthesis of small molecules— hydrogenation, hydrosilylation and cyclization— is reviewed in a chapter by Molander. A common theme through both these chapters is the role of ancillary ligands in achieving the desired selectivity in synthetic reactions.

The book achieves its aim of giving an update of recent developments in the rapidly expanding area of lanthanides in organic synthesis. However, it should not be seen as a comprehensive account of this area, as well-established procedures such as the use of cerium(IV) in oxidation and the applications of organocerium reagents are absent. It will be of most value to researchers who already know something of the area and are looking for an update on the latest developments.

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Alkene Metathesis in Organic Synthesis Topics in Organometallic Chemistry, Vol. 1

A. Fürstner (ed.)

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The aim of the *Topics in Organometallic Chemistry* series is to present critical overviews of research in organometallic chemistry which is influencing organic synthesis, pharmaceutical research, natural products chemistry and biology, catalysis, polymer research and materials science. Each volume covers one topic. The target audience is academic and industrial chemists of graduate level and above. The volumes are written for both the specialist and non-specialist.

The term 'metathesis' derives from the Greek *metatithenal* (transpose, change the position of). Older inorganic chemists will recall using it as a synonym for double decomposition, as when sodium sulphate and barium chloride in water exchange ions and barium sulphate is precipitated. In organic chemistry metathesis refers to the transfer of a functional group from one molecule to a related molecule: in the present context, thus occurs between alkenes, e.g.

$$\begin{array}{c} CH_2 = CHR \\ + \\ CH_2 = CHR \end{array} \leftrightarrow \begin{array}{c} CH_2 \\ \| \\ CH_2 \end{array} + \begin{array}{c} CHR \\ \| \\ CHR \end{array}$$

Such reactions are reversible and require a catalyst. Among the early catalysts were $Mo(CO)_6$ and $W(CO)_6$; alkene metathesis was discovered when heated alkenes were passed over the carbonyl complexes supported on alumina. A metal alkylidene complex, M=CHR or $M{=}CH_2$, is the key intermediate and may be generated by α-hydrogen abstraction from, for example, a molybdenum(VI) or tungsten(VI) dialkyl complex:

$$L_4(CH_2R)_2 \rightarrow M = CHR + CH_3R$$

In his Preface the volume editor, A. Fürstner, comments that olefin methathesis reactions were laboratory curiosities until the advent of metal alkylidene complexes tolerant towards polar groups. Accordingly the book is devoted to mostly recent work illustrating the use of these complexes in organic synthesis. The chapters are comprehensive and authoritative, with most contributors including a good mix of organometallic structural chemistry, reaction mechanisms and organic syntheses, including some difficult syntheses which could not be accomplished without the alkylidene complexes.

The topic is introduced in the first chapter (Richard R. Schrock) with an account of olefin metathesis by well-defined complexes of molybdenum and tungsten and covering important reaction types which crop up in subsequent chapters (cross-coupling, ring-opening metathesis polymerization (ROMP), ring-closing metathesis (RCM) and acyclic diene metathesis (ADMET) polymerization). Ruthenium catalysts are described by A. Fürstner with applications to the synthesis of macrocycles and natural products, and in solid-phase combinatorial chemistry (referred to by a number of other contributors) and reactions in supercritical CO_2. Total synthesis of the cytotoxic epothilones and polyether natural products by RCM with ruthenium and cyclopentadienyltitanium complexes is described in detail by K. C. Nicolaou, N. Paul King and Yun He, who provide a fascinating insight into their synthetic strategies. In his chapter, Air H. Hoveyda describes the successful use of new metathesis catalysts in enantioselective total syntheses. Later chapters, all of which include descriptions of natural products and pharmaceutical syntheses, cover enyne metathesis (Miwako Mori), cross-metathesis (Susan E. Gibson and Stephen P. Keen), ADMET chemistry (D. Tindall, J. H. Pawlow and K. B. Wagener), and bioactive polymers (Laura L. Kiessling and Laura E. Strong).

The chapters are complete in themselves with rather little overlap. References are up to date and comprehensive. There is sufficient detail to make it a useful resource for examples of applications of generally well-characterized organometallics in organic synthesis. The perplexed organic chemist might find inspiration. As a 'non-specialist' I enjoyed reading this book and learned a lot. I must, however, deplore the absence of an index — unbelievable in this word-processing age! Otherwise: altogether a successful publication — and the price at 28 p per page is, unusually, not outrageous. It should certainly be in university and company libraries and is affordable by dedicated personal purchasers.

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