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Book Review

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Catalytic heterofunctionalization: from hydroamination to hydrozirconation

Wiley-VCH, Weinheim, Germany, 2001; 304 pp; price £75
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With the ever-increasing demands on chemists to synthesize molecules in an energy efficient, atom economical, and environmentally friendly way and in high optical purity, the need for the use of catalytic methods is high. This monograph, therefore, is a timely summary of the achievements and state of the art in homogeneously catalysed addition reactions of heteroelement–hydrogen and heteroelement–heteroelement compounds to unsaturated substrates, including addition to carbonyls and thiols.

The text is divided into eight chapters, dealing in turn with the addition of the elements boron, aluminium, silicon, nitrogen, phosphorus, oxygen, sulfur and zirconium to unsaturated substrates. Each chapter is well referenced, and in a number of chapters the authors give the reader valuable practical advice.

Chapter 1 deals primarily with the metal-catalysed addition and coupling reactions of B–H, B–B, B–Si and B–Sn reagents to unsaturated substrates for the synthesis of a diverse range of organoboron compounds. For the systems discussed, their advantages and limitations are well highlighted. Where appropriate, mechanistic details or mechanistic postulations are given.

Chapter 2 discusses the use of a range of transition metal catalysts to effect hydroalumination reactions. A brief overview is given of the value of these organoaluminium compounds for organic synthesis. Hydroalumination of polar C–C and C–heteroatom multiple bonds, including carbonyls, nitriles and imino groups as well as to α,β unsaturated compounds, is not discussed, yet this represents a significant area of research.

The area of asymmetric hydrosilylation is reviewed in Chapter 3. Particular emphasis has been placed on developments made to give both high enantioselectivity and regioselectivity in the hydrosilylation process.

Catalytic hydroamination is discussed in Chapter 4. The chapter begins with a brief historical overview of the area followed by a wide range of examples from the recent literature. A number of interesting mechanistic details and interpretations are presented.

Chapter 5 deals with hydrophosphination. The formation of P–C bonds by metal-catalysed addition of P–H to unsaturated substrates is covered. The reaction of P^{III} substrates (hydrophosphination) and P^{V} (hydrophosphorylation) is discussed.

Chapter 6 deals mainly with O–H activation using late transition metals mainly stoichiometrically, but there are also examples of catalytic activation. Large sections of this chapter are not involved with catalytic heterofunctionalization and, therefore, lie outside the title remit of this monograph.

In Chapter 7 the subject of catalytic activation of sulfur–X and selenium–X bonds is discussed. A wide range of examples of the introduction of sulfur into organic molecules is presented, illustrating the true synthetic potential of catalytic activation for this process.

Chapter 8 focuses on the synthesis of a range of zirconium hydrides and their addition across carbon–carbon multiple bonds. It must be noted that most of the examples in this chapter are *not* catalytic systems.

There are inclusions in this book that do not fulfil the remit imposed by the title, namely the inclusion of numerous examples of non-catalytic heterofunctionalization reactions. There are also some important areas not covered (e.g. hydroalumination of polar bonds, addition of dihydrogen to unsaturated substrates and C–H activation reactions) that may have found a place in a book of this nature. However, this book does provide a valuable reference source for academic and industrial chemists alike who are interested or involved in the areas of homogeneous catalysis and organic synthesis.

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