

Preface

The reduction of organic compounds is perhaps the most common reaction type in organic synthesis today. The development in this field has been tremendous, progressing from the use of stoichiometric reagents to the modern reactions that use cheaper, “greener” catalytic methods. The importance of the field has also been highlighted by the awarding of the 2001 Nobel Prize in Chemistry to Knowles and Noyori for their work on asymmetric hydrogenation, a key reaction among reductions.

The rapid development of this large field renders the task of editing a book on the topic difficult—how does one condense into a single book a subject that could easily fill multiple volumes? Although there are many ways to organize the material, we thought it would be helpful to do so according to the functional group being reduced. Needless to say, we also had to place severe constraints on the number of chapters in the book, as well as the number of methods for reducing certain functionalities. The aim of the book has been to present the reader with comprehensive material that covers the field and focuses on recent advances in the area.

We would like to thank the authors of each chapter for their willingness to contribute their expertise. We are also grateful for all the help we have received from VCH, and especially from Manfred Köhl and Stefanie Volk.

In Part 1, three methods for the reduction of alkenes are discussed: the asymmetric hydrogenations of both functionalized and unfunctionalized olefins are reviewed in Chapters 1 and 2, the hydroboration of alkenes is discussed in Chapter 3, and Chapter 4 covers advances in the hydrosilylation of alkenes that were published after 1998.

Chapter 5 reviews the hydrogenation of carbonyl compounds and Chapter 6 discusses their reduction via transfer hydrogenation. Recent advances in the diastereo- and enantioselective hydroborations of carbonyl compounds are reviewed in Chapter 7. Current state-of-the-art hydrosilylations of carbonyls are summarized in Chapter 8, which covers transition-metal-catalyzed and transition metal-free methods, and even metal-free procedures. The fundamentals of and new methodology for improving the reactivity and selectivity of enzymatic carbonyl reductions are explained in Chapter 9.

In Chapter 10 several new strategies for the hydrogenation of imines are described. This chapter deals first with iridium-based catalytic systems, then considers other metals (Rh, Ru, Ti, Zr and Au). The transfer hydrogenation of imines, focusing on more recent synthetic applications, is reviewed in Chapter 11. Chapter 12 highlights some of the latest developments in the use of boron hydrides and related diboron compounds for the reduction of imines. The hydrosilylations of imines that have been discovered and developed during the past 10–15 years are the focus of Chapter 13.

Chapter 14 discusses a field that has gained an enormous attention recently: the use of small organic compounds as catalysts for the reduction of alkenes and imine functionalities. Reviewed in Chapter 15 are three methods for the reduction of alkynes: hydrogenation, hydroboration, and hydrosilylation. Recent advances in metal-catalyzed reductive aldol couplings are reviewed in Chapter 16. Dissolving metals have been extensively used as reducing agents for more than a century, and Chapter 17 discusses recent interest in their use for the selective reduction of specific polar functional groups (such as hindered cyclic ketones) and the reductive cleavage of some activated bonds. Chapter 18 focuses on the transition-metal-catalyzed hydroalumination and hydromagnesiation of alkenes, dienes and alkynes.

We hope that this book will be of value to chemists involved in organic synthesis in both academic and industrial research, and that it will stimulate further development in this important field.

Uppsala, January 2008

Pher G. Andersson
Ian J. Munslow