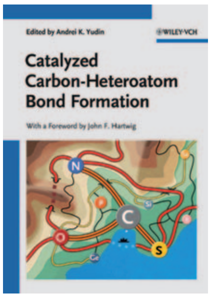
Catalyzed Carbon–Heteroatom Bond Formation



Catalyzed Carbon–Heteroatom Bond Formation
Edited by Andrei K. Yudin.
Wiley-VCH, Weinheim 2010.
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This book edited by Andrei K. Yudin summarizes recent developments in the area of carbon–heteroatom bond formation catalyzed by late transition metals. Covering the range from C–O bonds to C–N, C–S, and the less explored C–Se bonds, the book offers the reader not only a detailed account of the applications of the main players in these transformations (Pd, Rh, Au, etc) but also of the strategies that are available for the synthesis of useful molecular scaffolds. The ability to introduce carbon–heteroatom bonds into organic molecules is of utmost importance: first, C–X functionalities can open up new sites at which molecules can be further modified to introduce molecular complexity; second, the challenges associated with C–X bond formation have stimulated the development of innovative tools for achieving milder and more efficient methods. Finally, C–X bonds are important per se, as most of the key interactions of organic compounds with their biological targets stem from heteroatoms present in the ligand's scaffold. Thus, it is not surprising that the number of publications on C–X bond-forming reactions catalyzed by late transition metals has increased exponentially over the past 15 years.

The book is divided into 12 chapters, each authored by a key expert in the corresponding field. The first chapter, by Wolfe, deals with Pd-catalyzed C–N bond formation to give saturated five-membered rings. In Chapter 2, Dong describes the most recent advances in transition-metal-catalyzed synthesis of lactones, dealing both with mechanistic aspects and with applications to syntheses of highly complex natural products. The third chapter, by Beletskaya, introduces the reader to the area of C_{sp^2}–S and C_{sp^2}–Se bond formation, both via transition-metal-catalyzed cross-couplings as well as by addition-type reactions. The short Chapter 4, by Muñiz, is devoted to the Pd-catalyzed oxidative 1,2-difunctionalization of alkenes. In Chapter 5, Lebel focuses on Rh-catalyzed C–H amination reactions, including some of the more recent stereoselective methods reported up to now. Chapters 6, 8, and 9 deal with syntheses of aromatic heterocycles. The topic has been divided as follows: Pd-catalyzed methods are covered by Arndtsen in Chapter 6, whereas monocyclic and fused five-membered aromatic heterocycles are covered by Gevorgyan in Chapters 8 and 9, respectively. Chapter 7 focuses on the reactions of copper acetylides, especially on catalytic dipolar cycloadditions. In Chapter 10, Lautens reviews the most important contributions on Rh-catalyzed ring opening reactions using oxygen-, nitrogen-, and sulfur-based nucleophiles, with special emphasis on the asymmetric variants of these transformations. The book concludes with two chapters by Widenhoefer on gold catalysis: Chapter 11 deals with N- and S-nucleophile additions to C–C multiple bonds, while Chapter 12 focuses on oxygen nucleophiles.

The chapter organization could be improved. For example, Chapters 6, 8, and 9 seem to belong together, but the first two are separated by Chapter 7, which is completely unrelated. The same could be said of Chapters 5 and 10, both of which deal with Rh-catalyzed processes. More consistency in the length and depth of the chapters would also have been desirable: some chapters are very exhaustive, containing comprehensive tables on the scope of substrates, whereas others have been kept much more "conceptual", just focusing on the strategies and/or mechanisms (which in my view is more appealing for a broader audience). Although there are some noticeable examples of duplication, especially in the case of gold-catalyzed processes, the overlap among the different chapters has been kept to a minimum.

Overall, the book represents a comprehensive reference source, not only for those interested in reading about the latest results on catalytic transformations to form C–heteroatom bonds, but also for those seeking efficient methods to access synthetically relevant organic species such as piperidines, pyrroles, indoles, furans, etc. The individual chapters contain enough background information and up-to-date literature coverage to ensure that the book will continue to be useful over a reasonable period of time in this vibrant field. Every institution concerned with synthetic organic chemistry should have this book available on its shelves.

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Image and Reality

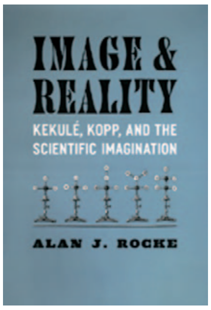

Image and Reality
Kekulé, Kopp, and the Scientific Imagination. Von Alan J. Rocke. The University of Chicago Press, Chicago 2010. 416 pp., hardcover, 45.00 €.—ISBN 978-0226723327

Before spectroscopic and other physical methods revolutionized chemistry essentially only two physical tools were available to chemists—most especially to those of the 19th century: the thermometer and the balance. Whereas the first was necessary for the determination of the purity of a substance (through its melting point and/or boiling point), the second served to determine the quantitative composition of compounds. With this