

Preface

Hydrocarbons are the main feedstock for the chemical industry from oil and natural gas. Generally, carbon–hydrogen (C–H) bond is not considered as a functional group due to its low reactivity and high thermodynamic stability. In recent years, the catalytic functionalization of inert C–H bonds has become an atom-economical and sustainable way to construct new chemical bonds, avoiding the preparation of coupling precursors. The ubiquitous nature of C–H bonds in organic compounds offers us an exciting platform to create new chemistry. The “International Symposium on C–H Activation” is held every 2 years (first in Beijing in 2012; second in Rennes in 2014), and over 200 scholars from about 30 countries participated in the first and second conferences. The third symposium will be held in Montreal in May 2016. The group of “C–H activation” is still growing fast. It becomes a dynamic research project in the disciplines of synthetic chemistry and sustainable chemistry.

C–H bond functionalization is in transition from its infancy to adolescence. In the past decade, a great number of achievements were accomplished in C–H bond functionalization. Chemists have created a series of new methodologies and new strategies to make the chemical reactions more sustainable: from one C–H bond to two C–H bonds coupling, from noble metal catalysis to cheap metal catalysis, and even to metal-free process. However, how to selectively cleave and functionalize C(sp³)-H bond still remains a great challenge owing to its weakest reactivity in organic chemistry. In this book, we mainly discuss the recent advancement of sustainable C(sp³)-H bond functionalization strategies, providing one powerful route to direct construction of carbon–carbon and carbon–heteroatom bonds.

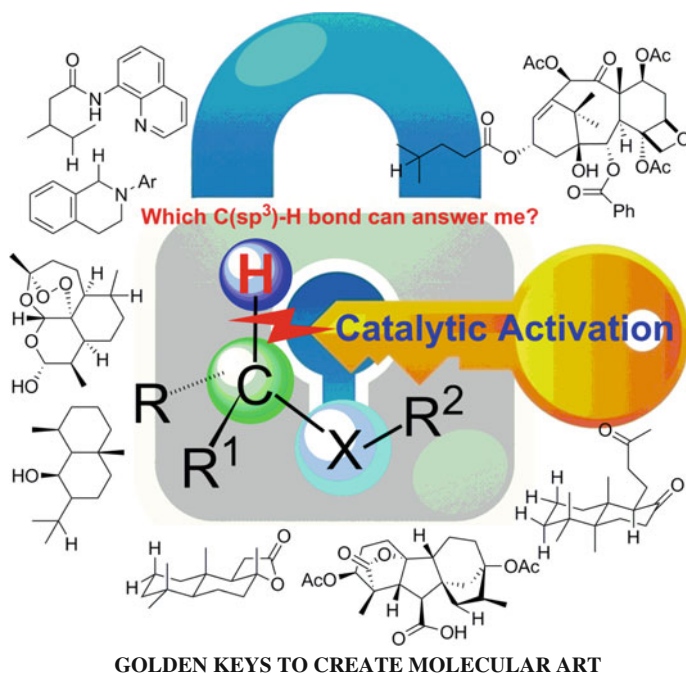
Most references in the book have been published in the recent 5 years. They will bring us a new chance to review the relevant progress of C(sp³)-H bond functionalization and also offer a new research direction. In Chap. 1, we introduce the transition-metal-catalyzed unactivated C(sp³)-H bond functionalization using different directing functional groups. Enantioselective functionalization of unactivated C(sp³)-H bond is very exciting, and the seminal work of J.-Q. Yu is highlighted. In Chap. 2, we mainly focus on the nondirected C(sp³)-H bond functionalization in the

presence/absence of transition metal catalysts. Depending on the electronic, steric, and stereoelectronic properties of the substrate, catalytic oxidative functionalization of α -C(sp³)-H bond adjacent to heteroatoms, oxidative functionalization of allylic, benzylic C-H bonds, and unactivated C(sp³)-H bonds are discussed. The transition-metal-catalyzed redox-neutral C(sp³)-H bond functionalization is also briefly introduced in Chap. 2. As an emerging sustainable synthetic strategy, visible-light-promoted C(sp³)-H bond functionalization is summarized in Chap. 3.

Each chapter is concluded with a perspective of the C(sp³)-H bond functionalization methods. We hope this book will be interesting to a wide readership in organic, organometallic, and green chemistry.

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Jin Xie
Chengjian Zhu



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Xie, J.; Zhu, C.

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