

N-Heterocyclic Carbenes

Organometallic chemistry and homogeneous catalysis especially have witnessed substantial transformation with the discovery of stable carbenes and the easy accessibility of a variety of N-heterocyclic carbenes as versatile ligands. The significance of this development has been recognized in numerous themed issues of peer-reviewed journals, in particular a special issue in *Chemical Reviews* in 2009, and a good handful of books. The new title *N-Heterocyclic Carbenes—Effective Tools for Organometallic Synthesis* edited by Steven Nolan now provides an updated overview of this exciting and rapidly growing area of chemistry, with a particular focus of the book directed towards the synthesis and catalytic applications of metal carbene complexes. This book is certainly the most comprehensive monograph on the organometallic chemistry of N-heterocyclic carbenes and a significant expansion when compared to the existing compilations on this burgeoning topic. With 16 chapters, all written by leading experts in their field, this book offers a broad overview of all facets of modern N-heterocyclic carbene metal chemistry.

The first three chapters introduce basic and advanced principles of N-heterocyclic carbenes as ligands, including aspects of stability, synthetic methodologies, steric and electronic implications of the ligands and a thorough discussion of chiral N-heterocyclic carbenes and their application in asymmetric catalysis. In the subsequent 12 chapters the focus is moved from the ligand to variation of the metal center, with each chapter centering on a specific metal, or groups of metals. These chapters cover almost all types of metals and include main group elements, early transition metals, and dedicated chapters on nickel, copper, palladium, platinum, gold, iridium and rhodium, as well as ruthenium, the latter divided into a chapter on olefin metathesis and a refreshing overview on non-metathesis transformations. This portion also includes two chapters on medicinal aspects of N-heterocyclic carbene complexes of silver and copper. Recent reports indicate that various other metal carbene complexes display highly interesting biological properties, and this topic will surely expand considerably in the near future. The last chapter of the book again centers on a specific class of ligands and surveys catalytic applications based

on acyclic aminocarbenes, formally not a subclass of N-heterocyclic carbenes, but chemically highly reminiscent and hence an attractive alternative to classical N-heterocyclic carbene ligands.

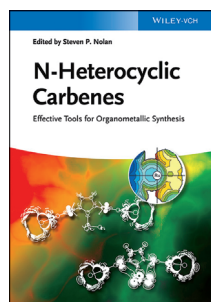
The explosion of research into N-heterocyclic carbene complexes for homogeneous catalysis obviously precludes a comprehensive treatment of the topic as vast literature is available in particular in palladium-catalyzed cross-coupling, ruthenium-catalyzed olefin metathesis, and low-valent rhodium and iridium carbene catalysis. Ample reference to previous reviews is very helpful and the authors of these and indeed of all the chapters succeeded very well in finding a sophisticated balance in providing a general overview and simultaneously an in-depth discussion of specific topics. Most exciting recent developments are highlighted, and often state-of-the-art catalytic activities and selectivities are critically reviewed, thus providing a benchmark for further research activity in these areas.

If there is one criticism to the book, then it is the fact that the carbene ligands are drawn in about half a dozen different schematic representations, ranging from a “C” to denote the carbenic carbon to dative bonds with arrows, and on to dashed, solid or no π electrons at all in the carbenic ligand. While only a formal aspect (and a prevalent inconsistency also in the primary literature), the field would benefit from a consistent (and correct) representation of either a carbenic or an ylidic form. Irrespective of this minor and formal aspect, this textbook provides an excellent overview on N-heterocyclic carbene chemistry. The significant progress accomplished in the relatively short time between the appearance of this book and the previous textbooks and themed reviews demonstrates the timeliness of this monograph and is clear testimony of the many discoveries that carbene chemistry has been offering and continues to offer. Opportunities for further activities are vast and emerging areas can readily be extracted through careful reading of this book. Hence, *N-Heterocyclic Carbenes—Effective Tools for Organometallic Synthesis* provides an excellent entry point to those aiming to access this exciting field and a most recommendable reference to experts in the area.

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