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Topics in Heterocyclic Chemistry

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Aims and Scope

The series Topics in Heterocyclic Chemistry presents critical reviews on present and future trends in the research of heterocyclic compounds. Overall the scope is to cover topics dealing with all areas within heterocyclic chemistry, both experimental and theoretical, of interest to the general heterocyclic chemistry community.

The series consists of topic related volumes edited by renowned editors with contributions of experts in the field.

More information about this series at <http://www.springer.com/series/7081>

Marco Bandini

Editor

Au-Catalyzed Synthesis and Functionalization of Heterocycles

With contributions by

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Preface

“Noble,” “coinage,” “precious”...so many “labels” have been utilized over the years to describe gold. All of them are certainly correct with the exception of the one that probably affected mostly the role of the late-transition metal in chemical reactivity: “inert”. As a matter of fact, besides the intrinsic inertness of gold in the elemental form, [Au(I)] and [Au(III)] species have displayed unique physical-chemical properties that led to unexpected applications in homogeneous catalysis with particular regard to electrophilic activations of unactivated unsaturated hydrocarbons. Doubtless, the chemistry of π -systems has faced a revolution in terms of chemical scope, mildness of reaction conditions, and selectivity over the past fifteen years, due to the establishment of this metal in catalysis. A rough search on database dealing with the item “gold catalysis” can better highlight the state-of-the-art impact of organometallic gold species in organic synthesis. Impressively, gold (141 articles in 2014) has already reached longtime used metals such as palladium (125 articles in 2014) and copper (60 articles in 2014) and already overcame other “neighbors” in the periodic table such as silver (30 articles in 2014) and rhodium (38 articles in 2014).

The innate tolerance of gold catalysis toward “hard” hetero moieties contributed to its diffusion on the synthesis of densely functionalized molecular scaffolds including heterocyclic cores. This volume provides an overview of the most efficient and synthetically useful approaches to the construction of heterocyclic motifs by means of homogeneous gold catalysis.

The chapters have been written by leading experts; emphasis has been addressed to both scope and limitation of the methodologies. Additionally, mechanistic insights are provided in order to ensure a proper rational of the chemical outcomes. Main activation modes and reaction machineries (i.e., electrophilic additions), triggered by gold coordination to π -systems, have been highlighted with particular regard to alkynes, alkenes, and allenes. Besides these intriguing C–X bond-forming events, gold catalysis found substantial applications also in the manipulation of C–C triple bonds via rearrangement reactions as well as site-selective oxidative protocols. Recent and leading examples in these realms have been also accounted and described in dedicated chapters.

Additionally, the well-established attitude of gold-based catalytic systems in assisting the activation/functionalization of inert C–H bonds has been documented with the aim of shedding light on the applicability of readily available and unfunctionalized heteroarenes for the synthesis of added value compounds.

The latter two chapters have been dedicated to the impact of gold on asymmetric transformations and total synthesis of natural products. I personally consider these frameworks two hot topics of the nowadays-homogeneous gold catalysis.

Obviously, I feel indebted to the colleagues who agreed to contribute in the realization of this account, and I apologize to the authors left out this time.

I do really hope that the book could contribute in stimulating new perspectives and developments in the blooming research area and could encourage even more practitioners in engaging in this fascinating research topic.

Bologna, Italy
April 2016

Marco Bandini

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