Edited by Pierre H. Dixneuf
and Victorio Cadierno

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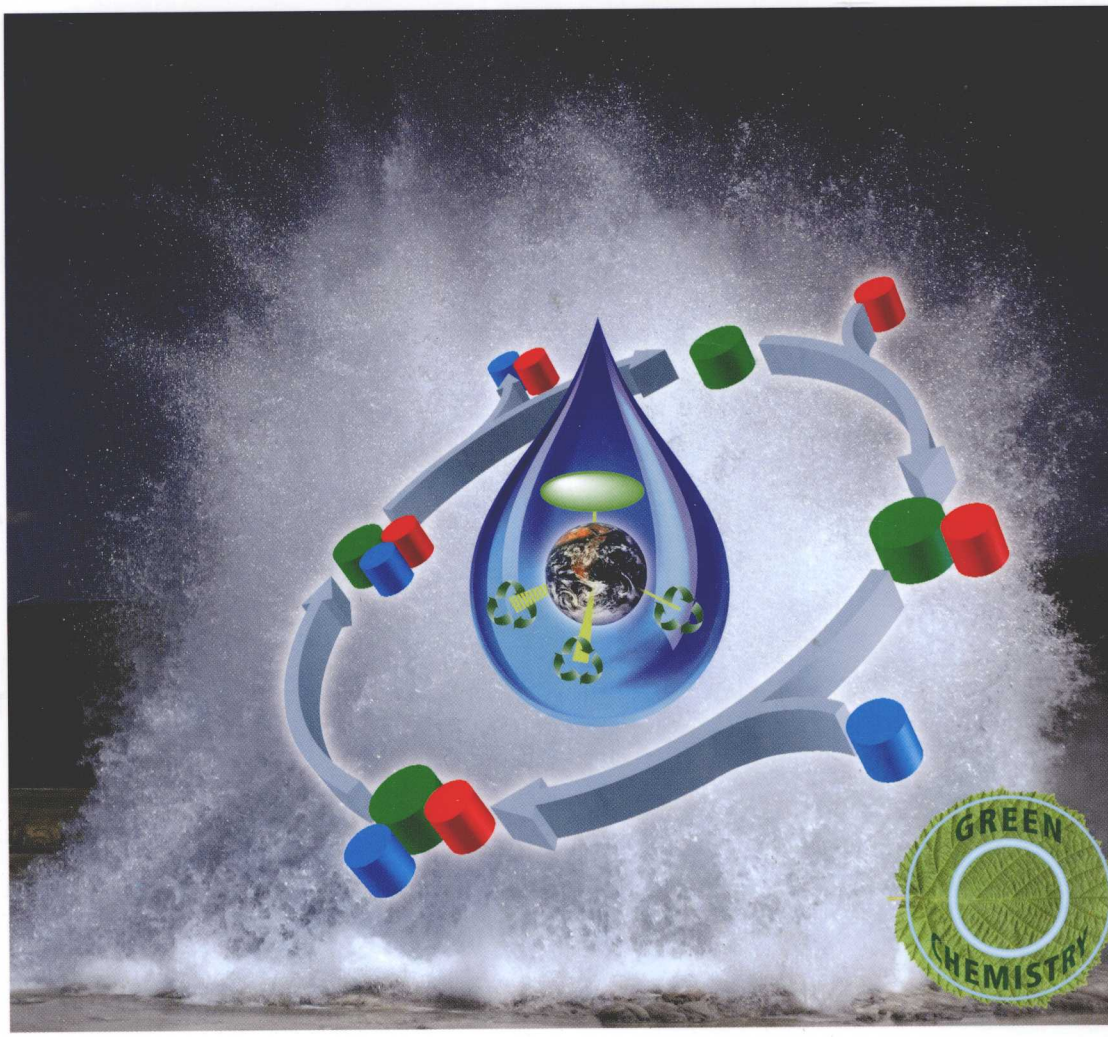
Metal-Catalyzed Reactions in Water



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Metal-Catalyzed Reactions in Water

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Preface

Metal catalysis represents a frontier field of research. The ability of metal complexes to catalyze organic reactions, and to selectively create new ones, is now the basis of the most powerful strategies leading to new synthetic methods. *Homogeneous catalysis* has brought a revolution in fine chemical synthesis, drug and cosmetic discovery, in the preparation of molecular materials and polymers, and it is more active than ever before.

Catalysis, one of the twelve principles of *Green Chemistry*, is offers selective processes with energy and atom economy and is an essential partner for sustainable manufacturing in the chemical industry. Within this context, the use of a safe, nontoxic, eco-friendly, and cheap solvent is also advised. Water is probably the most appealing candidate as an easily available, noninflammable, nontoxic, and renewable solvent. Consequently, the use of water as a solvent in synthetic organic chemistry and materials science has spread throughout the chemical community at a staggering pace during the last two decades.

The combination of metal catalysis and water has led in recent years to the development of a huge number of new and greener synthetic methodologies. Although the hydrophobic character of most organic compounds has been for long time considered as a major drawback, it is nowadays well documented that even when the reaction medium is heterogeneous, "on water" conditions, an enhancement on the catalyst activity and/or selectivity can be observed by using water as solvent. The low solubility and inherent instability of organometallic compounds in water is another limitation that has also been largely surpassed in recent years by designing new hydrophilic ligands and more robust, air- and water-stable catalysts. Moreover, the use of metal catalysts in water or in a two-phase system offers other advantages versus more classical organic solvents, that is, it simplifies the separation of the products, and that of catalyst, thus favoring water recycling, a very important aspect for large-scale chemical processes. New discovered techniques in nanofiltration and in recovery of metal ions from water contribute to this field. All these facts make catalysis in aqueous systems a very active field of research today, both from an academic and an industrial point of view. In fact, metal catalysis in water is now in the heart of the main fields of contemporary chemical research.

The content of this volume gathers the main aspects and potentials of metal catalysis in water, including C-C cross couplings (Chapter 1), C-H bond activations (Chapter 2), nucleophilic additions of alkynes (Chapter 3), hydroformylations (Chapter 4), oxidation processes (Chapter 5), hydrogenations (Chapter 6), rearrangements and allylations (Chapter 7), olefin metathesis reactions (Chapter 8), and nanocatalysts in water (Chapter 9).

The aim of this book is to introduce the readers to this topic through cutting-edge results from the recent literature, and the know-how shared by the chapter authors. This volume should be helpful to academic and industrial researchers involved in the fields of catalysis, new greener organic synthetic methods, water-soluble ligands, and catalysts designing and also to teachers and students interested in innovative and sustainable chemistry.

We are grateful to the Wiley-VCH team who made this project practical and to all the contributors to this volume for their effort and enthusiasm in sharing their expertise to join this *aquatic* editorial enterprise.

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