

Preface

The application of the right solvent in chemical reactions is always a key-point for a chemist. In addition to conventional organic solvents several alternative ones were tested. Among them ionic liquids (ILs) and especially room temperature ionic liquids (RT-ILs) play an important role due to their environmentally benign properties such as extremely low vapor pressure, chemical and thermal stability, high ionic conductivity, and good solvent properties towards both ionic and covalent compounds.

A major drive of these efforts with ionic liquid both in industry and in fundamental research is to find more environmentally friendly technologies for traditional ones in which damaging and volatile organic solvents are generally used. Ionic liquids are considered not only as promising surrogates of organic solvents in conventional text-book reactions, but also their applications show an upward tendency also in catalytic reactions.

In this book we intend to summarize the recent achievements in catalytic reactions carried out in ILs. Leading scientists worldwide accepted our invitation to contribute to this volume and write about the recent developments. Although most chapters of the book are mainly focused on the catalytic reactions of synthetic importance, where appropriate, theoretical and mechanistic aspects are included in order to help the reader understand the underlying principles. We are confident that this book will provide a comprehensive overview of topics of current interest for the non-specialist reader.

One of the fundamental issues, the homogeneous or heterogeneous catalysis in ILs, is discussed by N. Yan (chapter “The Nature of Metal Catalysts in Ionic Liquids: Homogeneous vs Heterogeneous Reactions”). The formation of nanoparticles, as well as their application in catalytic reactions (hydrogenation, coupling reactions, methanol synthesis), is discussed by Ch. Janiak (chapter “Metal Nanoparticle Synthesis in Ionic Liquids”). P. Lignier’s contribution is dealing with the size control of metal nanocrystals in ILs (chapter “Size Control of Monodisperse Metal Nanocrystals in Ionic Liquids”). C. Chiappe et al. report on the structural features and properties of metal complexes in ILs with special focus on anionic speciation of metals (chapter “Structural Features and Properties of Metal

Complexes in Ionic Liquids: Application in Alkylation Reactions”). The state of the art in ionic liquid-based hydroformylation is reviewed by B. Rieger et al. (chapter “Ionic Liquids in Transition Metal-Catalyzed Hydroformylation Reactions”). The research carried out recently in the field of carbonylation of alkenes and alkynes, as well as aryl and alkenyl halides in the presence of O- and N-nucleophiles, is summarized by R. Skoda-Földes (chapter “ILs in Transition Metal-Catalysed Alkoxy- and Aminocarbonylation”). Metal-catalyzed oxidations of alcohols and sulfides are discussed by A.M. Afonso et al. (chapter “Metal-Catalyzed Oxidation of C–X (X=S, O) in Ionic Liquids”). Recent results on epoxidation of various olefins by different transition metal complexes, as well as by metal-free compounds in ILs, are summarized by F.E. Kühn et al. (chapter “Epoxidation of Olefins with Molecular Catalysts in Ionic Liquids”). The beneficial effect of ILs in terms of activity, selectivity, and recyclability in cross-coupling reactions such as Heck, Suzuki–Miyaura, Stille, Sonogashira, Ullmann, and Negishi couplings is described by P. Mastrolilli et al. (chapter “Ionic Liquids in Palladium-Catalyzed Cross-Coupling Reactions”). The chapter of Ch. Bruneau et al. covers the catalytic olefin metathesis reactions carried out in RT-ILs (chapter “RTILs in Catalytic Olefin Metathesis Reactions”). Selected examples of polymerization and oligomerization catalyzed by transition metal complexes in ILs are presented by A.M. Trzeciak (chapter “Ionic Liquids in Transition Metal-Catalyzed Oligomerization/Polymerization”). The efficiency of transition metal-catalyzed asymmetric reactions providing precursors of pharmaceutical importance is described by Q.-H. Fan et al. (chapter “Ionic Liquids in Transition Metal-Catalyzed Enantioselective Reactions”).

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As volume editors we kindly recommend the present book entitled *Ionic Liquids in Organometallic Catalysis* to the attention of research scientists at universities or in industry, as well as graduate students.

Pécs, Hungary
Porto Alegre, Brazil

László Kollár
Jairton Dupont

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