

# Preface

The cross-coupling reactions, developed for the first time in the 1970s, were acknowledged by the award of the Nobel Prize in Chemistry to three researchers in December, 2010. These cross-coupling reactions have been developed remarkably over the past 40 years vis-à-vis a variety of transition metal catalysts, organometallic reagents, and organic halides. They have enabled the formation of carbon–carbon bonds between unsaturated organic compounds, which is the fundamental framework of organic synthesis. It has become possible to produce extremely complex molecules through the development of the cross-coupling reactions, and as a result, highly selective carbon–carbon-bonding reactions have been achieved.

The large number of publications concerning cross-coupling is continually increasing. The kinds of transition metals used as catalysts, and the organometallic reagents used as coupling partners have also widely expanded in recent years. It has become possible to form a variety of very specific types of carbon–carbon bonds through appropriate selection of the reagents.

Although there are numerous books and reviews on the cross-coupling reactions, until now most of these books have been mainly categorized according to the eponymous (named) reactions. The cross-coupling reactions have had a tremendous impact not only in academic arenas but also in industry. These catalyzed reactions are accomplished using the transition metal complexes with extremely high utility. In this book, from the viewpoint of application, the authors select several representative cross-coupling reactions and classify the types of compounds using the most up-to-date references available. The authors refer to the historical background of the cross-coupling reactions and to the reaction mechanisms. Then the categories of compounds are outlined in order of natural products, pharmaceuticals, liquid crystals, and conjugate polymers. Finally, recent progress is introduced in the form of the new cross-coupling reactions involving aryl chlorides and alkyl halides bearing  $\beta$ -hydrogen as coupling electrophiles.

The authors hope that this book will provide the fundamental basics to both undergraduate and graduate-student readers, but also wish to inspire continued development and innovation of the cross-coupling reactions.

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