Cross-Coupling Reactions of Organoboranes: An Easy Way for Carbon-Carbon Bonding

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Carbon-carbon bond-formation reactions are important processes in chemistry, because they provide key steps in the building of complex organic molecules. They are also vital in developing the new generation of ingeniously designed organic materials with novel electronic, optical, or mechanical properties.

During the past 40 years, most important carbon-carbon bond-forming methodologies have involved using transition metals to mediate the reactions in a controlled and selective manner.The palladium-catalyzed cross-coupling reaction between different types of organoboron compounds and various organic halides or triflates in the presence of base provides a powerful and general methodology for the formation of carbon-carbon bonds. The (sp^3)C-B compounds (alkylboron compounds) and (sp^2)C-B compounds (such as aryl- and 1-alkenylboron derivatives) readily cross-couple with organic electrophiles to give coupled products selectively in high yields. Recently, the (sp)C-B compounds (1-alkynylboron derivatives) have been also observed to react with organic electrophiles to produce expected cross-coupled products. Such coupling reactions offer several advantages.

These coupling reactions have been actively utilized not only in academic laboratories but also in industrial processes including pharmaceutical and agrochemical industries, and liquid crystal and OELD production in industry.

In this lecture, the overview of the coupling reaction will be discussed.