Abstract

The organoboron compounds are widely used building blocks in synthetic chemistry. Traditionally, these compounds are utilized in the formation of carbon-carbon (C-C), carbon-oxygen (C-O) or carbon-nitrogen (C-N) bonds. In this thesis, a reliable and reproducible method for the preparation of triethylammonium tetra-arylborates (TEATAbs) has been developed. Using this preparation method, six novel differentially functionalized TEATAbs were synthesized and the utility of these compounds was demonstrated in C-C bond formation reactions, such as Suzuki-Miyaura cross-coupling and asymmetric conjugated addition. The study gives new information about the reactivity of borates and it also clarifies their behavior during these reactions. In Suzuki-Miyaura reaction, a TEATAB proved to be as effective a coupling partner as its commercially available sodium salt. However, a huge reactivity difference was observed in the TEATAbs prepared.

For asymmetric applications, novel chiral indole-olefin-oxazoline (IndOlefOx) ligands were designed and synthesized. The ligands were prepared by using a convenient procedure in four to seven steps starting from commercially available 2-indolecarboxylic acid. Using the ligands, the rhodium-catalyzed conjugate addition between 2-cyclohexenone and organoboronic acid proceeded in good yield and in high enantioselectivity. Following these results, the ligands were exploited when the reactivity of different organoboron compounds were studied in asymmetric addition. In the introduction of the thesis, the preparation of organoboron compounds and their utilization in Suzuki-Miyaura cross-coupling and rhodium catalyzed 1,4-addition is discussed.