S01-3 New reagents and catalytic reactions for the synthesis of organoboronic acids

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Organoboronic acids play important roles in synthetic organic chemistry on the basis of the rapid development and improvement of their transformation reactions, including Suzuki-Miyaura coupling reaction, transition-metal-catalyzed conjugate additions, oxidative Heck-type reactions, and Petasis reactions. To take full advantage of the unique reactivities of organoboronic acids, it is highly desirable to explore new synthetic routes to a wide variety of organoboronic acids, including highly functionalized and enantioenriched derivatives. We have been involved in studies on the development of new synthetic methods for organoboronic acids. We are particularly interested in developing new boron-based reagents and catalytic reactions for their synthesis. I herein describe our recent studies on the synthesis of organoboronic acids by transition-metal-catalyzed reactions of silylboranes, cyanoboranes, alkynylboranes, and chloroboranes, which led to new catalytic B–C bond forming reactions such as silaboration, dehydrogenative borylation, and carboborations. Furthermore, our recent finding on the new protective group for the boronyl group ($B(OH)_2$) is also described. The “boron-masking strategy” enabled functionalization of organoboronic acids with retention of the boron substituents via reactions such as Suzuki-Miyaura coupling and Buchwald-Hartwig amination, in which free boronyl groups are reactive.