Silicon possesses some crucial differences from carbon (e.g., covalent radius and electronegativity). Thus, when a carbon atom is replaced by a silicon atom (the C/Si switch), the chemical and physicochemical properties of an organic compound may be changed dramatically. For example, silacyclopentadiene (often named silole) as organic material of electronic and optoelectronic devices demonstrates much superiority to its carbon-analogue, cyclopentadiene. In particular, the C/Si switch strategy has been applied successfully for odorant design and pharmaceutical applications. Furthermore, specific properties can be expected from totally new silicon-containing compounds, of which the carbon analogues cannot be synthesized or are very difficult to make. Thus, as a consequence, the development of synthetic methods for silacyclic compounds remains one of the most important frontiers in synthetic chemistry.

The C(sp³)-Si bond and silyl C(sp³)-H bond in trialkylsilyl groups such as SiMe₃ are among the most frequently encountered C-Si and C-H bonds, because many compounds are substituted with trialkylsilyl groups. Thus, a transition metal catalyzed coupling reaction accompanied with selective cleavage of the trialkyl C(sp³)-Si bond¹ and silyl C(sp³)-H bond² would be of great challenge and would lead to a synthetically useful protocol for the synthesis of diversified silacycles.³ In this presentation, synthetic methods recently developed in this research group along this line will be introduced.

References: