

IX-H Synthesis of Buckybowls and Heterobuckybowls

Bowl-shaped π -conjugated compounds including partial structures of the fullerenes, which are called "buckybowls," are of importance not only as model compounds of fullerenes but also as their own chemical and physical properties. Heteroatom-containing buckybowls (heterobuckybowls) have also been expected to exhibit unique physical characters. For example, in solution they show the characteristic dynamic behavior such as bowl-to-bowl inversion. On the other hand, they sometimes favor stacking structure in a concave-convex fashion in the solid state, giving excellent electron conductivity. Furthermore, some buckybowls are conceivable to possess the bowl-chirality if the racemization process, as equal as bowl-to-bowl inversion, is slow enough to be isolated. However, very few buckybowls/heterobuckybowls has been achieved for preparation mainly due to their strained structure, and no report on the preparation of chiralbowls has appeared. In addition, most of thus-reported procedures are performed under severe reaction conditions, limiting the sort of the introducible atoms/functional groups.

In the present project, we develop the rational route to the various kinds of buckybowls/heterobuckybowls using the organic synthesis approach.

IX-H-1 Regio- and Stereo-Selective Synthesis of Multi-Substituted Benzene Derivatives by Cyclotrimerization of Haloalkene Derivatives

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Bridged multi-substituted benzene derivatives have been of interest because of the bond alternation of benzene ring and the utility for syntheses of cup-shaped molecules or buckybowls. The regio- and stereo-selective syntheses are important for the synthetic utility. Chiral multi-substituted benzene derivatives were synthesized from chiral halonorbornene derivatives through the regio- and stereo-selective cyclotrimerization catalyzed by palladium nanocluster. Thus prepared chiral benzene derivatives are expected to serve as the synthetic intermediates for chiral buckybowls.