Rim-differentiated pillar[5]arenes: self-assembly and chirality control

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As a rising star in supramolecular macrocyclic chemistry, pillar[n]arenes inherently combine many excellent characteristics of traditional macrocycles: easy to synthesis and functionalize, hydrophobic cavity with controllable size, and more importantly, high symmetrical structures.[1] Previous research on pillar[n]arenes was mainly based on their high symmetry due to synthesis limitations. Research on symmetry breaking of pillar[n]arenes remains underexplored.[2]

Herein, we synthesized rim-differentiated pillar[5]arenes bearing benzoic acids and alkyl chains on two rims.[3] Self-assembled dimeric and trimeric nanotubes based on the rim-differentiated pillar[5]arenes showed well defined shape, length and diameter (Fig. 1a). The planar chirality of these rim-differentiated pillar[5]arenes could be induced by chiral amines and controlled precisely via achiral regulators, producing a ternary chiral induction and memory system (Fig. 1c). In addition, chiral nanotubes with either *pS* or *pR* chirality were constructed by introducing stereogenic carbons on the alkyl chains (Fig. 1b).
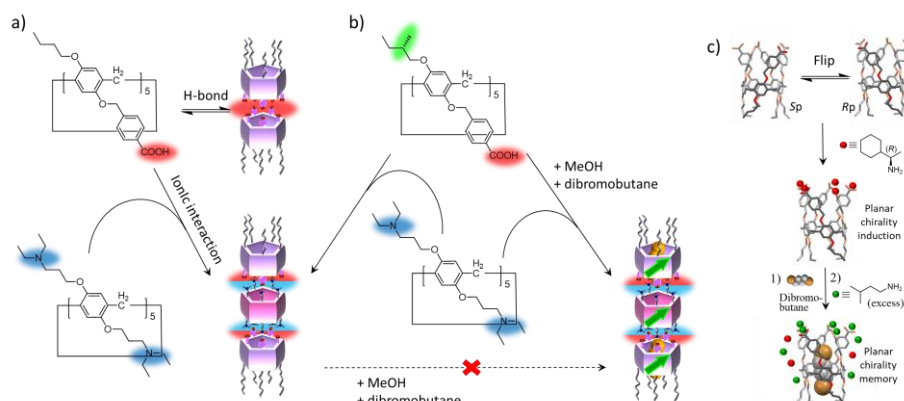

Fig. 1 Self-assembly and chirality control of rim-differentiated pillar[5]arenes. (a) Racemic and (b) chiral nanotubes formation. (c) Chiral induction and regulation.

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