Directed Assembly and Covalent Capture of Supramolecular Architectures in the Solid State

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In this presentation, we demonstrate how principles of supramolecular chemistry involving molecules that function as linear templates can be used to direct the formation of finite molecular assemblies with components that react to form covalent bonds. We demonstrate how forces such as hydrogen bonds and coordination bonds can be used to direct the construction of molecules. The targets include linear and bent cyclophanes, as well as molecular ladders. The ability to construct complex molecules in the solid state relies on an ability of the templates to insulate reactants from vexatious structural effects of molecular close packing, effects which have made directing the formation the covalent bonds in organic solids difficult to control. Thus, the templates are able to adapt to changes to size and shape of the reactants and thereby provide a mean to control the size and shape of the resulting products. In that way, the covalent-bonding-forming process provides a means to covalently capture the geometry of reactants within supramolecular architectures with structures largely independent of long-range packing. The molecular targets form in the organized, solvent-free environment of the solid state in 100% yield and gram quantities.

Keywords: supramolecular chemistry, covalent capture, hydrogen bonds