Dynamic Assembly of Porous Boronate Ester Macromolecules

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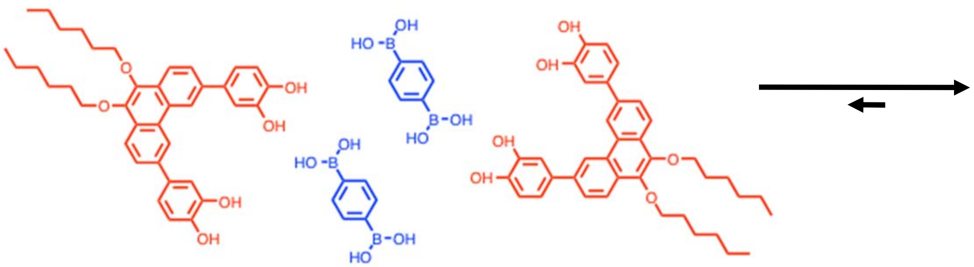
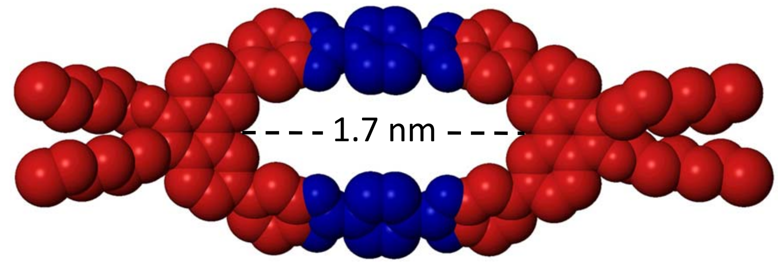
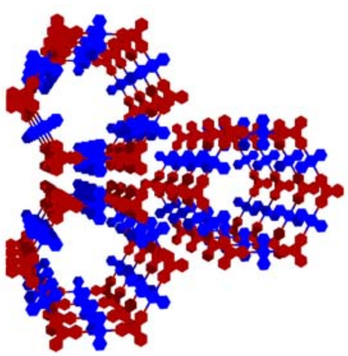
Molecular solids possessing nano and mesoscale pores (10^{-9} to 10^{-6} m) are extremely valuable for their uses in chemical catalysis, separations, and storage. Prime examples include the use of naturally occurring zeolite materials in the refinement of petroleum. Developing facile methods for the design and preparation of synthetic porous molecules will open the door to several new classes of materials that can be synthetically tailored for specific applications. The dynamic condensation of boronate esters from organic diols and boronic acids has recently enabled the synthesis of infinitely periodic Covalent Organic Framework (COF) solids. Unfortunately the insolubility of these COFs makes it difficult to fine tune their solid state structures. We are developing the spontaneous self-assembly of new, *discrete* boronate ester polygons that are *soluble* in organic solutions.



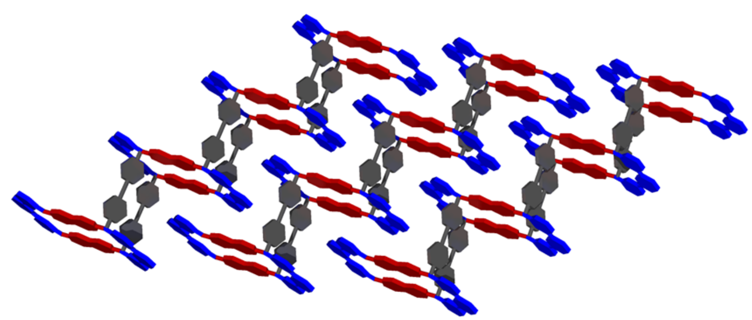


Soluble, nanoporous covalent organic polygon

The solubility of these porous Covalent Organic Polygons will enable greater control over their higher order assembly and solid state structures through the attachment of different chemical functionalities, through co-crystallization techniques, and through solution phase assembly on surfaces:



Porous solids



Crystal engineering