Studying 2D Self-Assembly to further Nanotechnology

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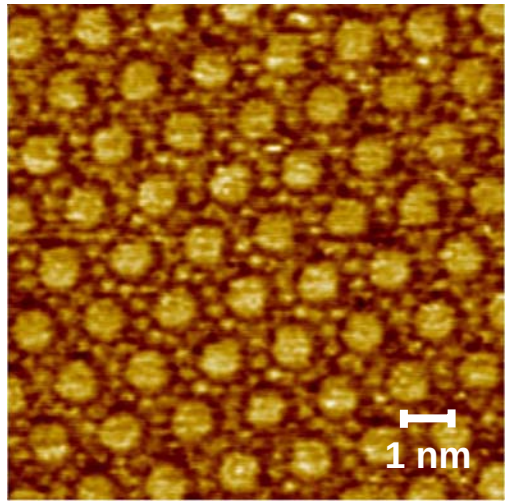
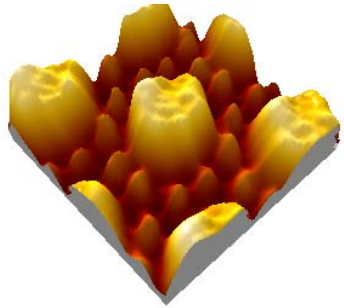
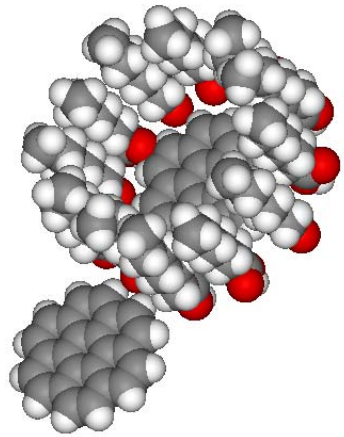
Award # CHE-0138409 & 0234726

Supramolecular chemistry -- the chemistry of weak noncovalent interactions -- is a key element in the development of nanotechnologies using the 'bottom-up' mode of construction. H bonding and other weak interactions can cause molecules to 'self-assemble' into complex structures. Our research concerns the rational design of 2D supramolecular structures. Here, we show how changes in a single functional group can significantly alter the structure of a self assembled surface.

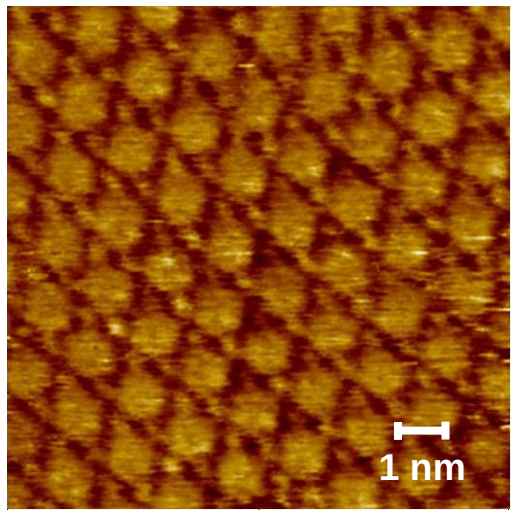
The STM images on the right depict the surface structures formed when gold is exposed to solutions of coronene in heptanoic acid and in heptaldehyde. The large features are due to coronene while the smaller dots are solvent molecules. These solvents are of nearly the same physical length. They differ only in that the aldehyde has one oxygen atom that can hydrogen bond while the acid has two. Due to the differences in these functional groups, the number of solvent molecules that surround the coronene changes. The disparity in surface structures is attributed to the difference in binding energies of the solvents to the gold, and in hydrogen bonding strength between the solvent and coronene.

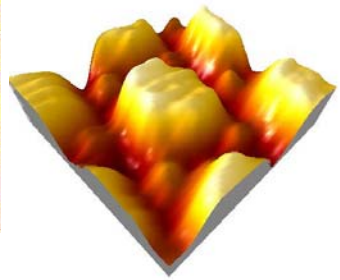






Coronene in heptanoic Acid





Coronene in heptaldehyde

K. W. Hipps, Brett Gyarfas, Bryan Wiggins, and Monica Zosel, *Langmuir* in press.