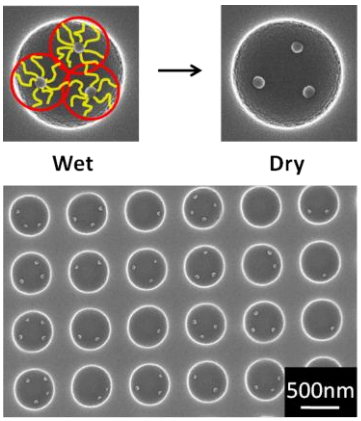
NANOHOUR

Wednesday, October 5, 2011 3:00 pm
Beckman Institute - Room 3269

Template Directed Assembly of Dynamic Micellar Nanoparticles

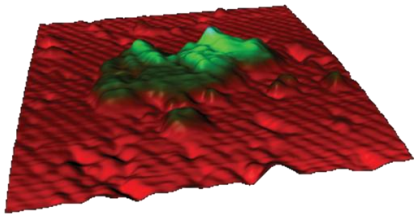
Kevin A. Arpin, Materials Science and Engineering
Graduate Student with Professor Paul Braun



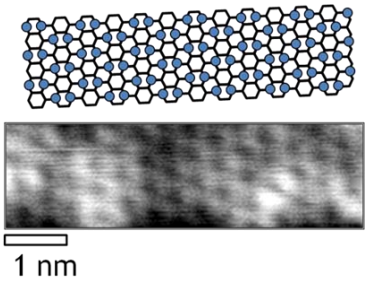
The ability to pattern functional nanoparticle arrays in multiple dimensions will enable future devices, which exhibit functions that cannot be realized using unstructured nanoparticle arrays. Here we demonstrate the unique assembly properties of dynamic micellar nanoparticles by combining a top-down lithographic nanopatterning technique with solution-based bottom-up self-assembly. The micelles consisted of a hydrophobic core (polystyrene) and a positively charged, hydrophilic shell (polyvinyl pyridine, PVP). In a pH 2.5 solution, the polymeric chains of the PVP shell repel each other, causing the shell to swell and the micelle diameter to reach 325 nm. However when dry, or in higher pH solutions, the micelles collapse to a diameter as small as 50 nm. These dynamic micelles were directed into arrays of lithographically defined recessed features by dip coating in the micellar solution. Successful assembly was achieved by controlling the electrostatic interaction between the positively charged micelles and the patterned templates. Two soft techniques, nanoimprint lithography and microcontact printing, were used to fabricate the templates with coupled topographical and electrostatic features. The dramatic shrinking of the micelles while remaining in a defined location offers unique opportunities for the self-assembly of multidimensional, nanometer scale arrays not accessible using hard sphere building blocks. Moreover, these dynamic structures represent a bridge between the larger scale of top down lithographic methods and the fine nanometer scale achievable using bottom up self-assembly.

Scanning Tunneling Microscopy Studies of Chemically-Modified Graphene Films

Scott Schmucker, Electrical and Computer Engineering
Graduate Student with Professor Joseph Lyding



Fully-fluorinated $(CF)_n$ on Si(100) 2x1:H



Single-sided C_xF on Cu

The scanning tunneling microscope (STM) has a unique ability to measure atomic-scale structural and electronic properties of novel materials, including a number of graphenic materials. We explore two related systems: double-sided graphene fluoride on silicon, and single-sided graphene fluoride on polycrystalline Cu. In this, the first atomic-scale study of monolayer graphene fluoride, we find that these novel materials can supplement the unique electronic properties of graphene by modulating its band structure.

Coffee and cookies will be served
http://nanohour.beckman.illinois.edu