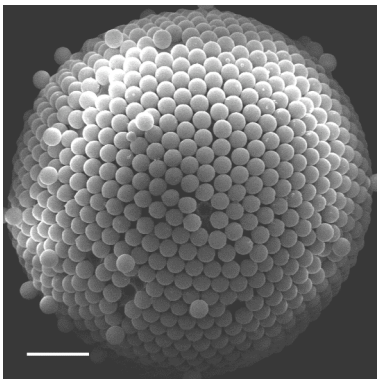
NANOHOUR

Wednesday, April 8, 2009 3:00 pm
Beckman Institute - Room 3269

Boil, Stir and Stew – Recipe for "Janus Particles"

Shan Jiang — Graduate Student, Materials Science & Engineering



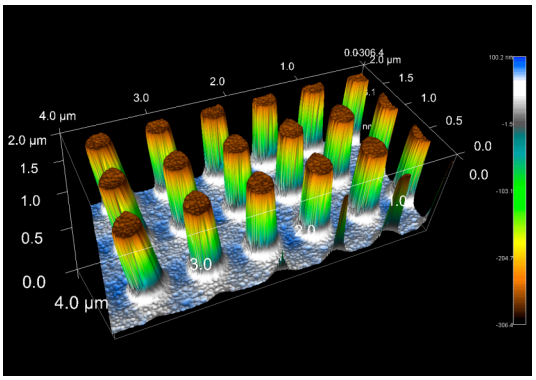
Colloidal particles are conventionally homogeneous. However, Janus and patchy colloidal particles have different chemistry on different portion of the surface. The breaking in symmetry brings new physics and opportunities to build novel structures. Our study focuses on making these unconventional particles and studying their dynamics and self-assembly structures.

In order to improve the productivity and the control over the geometry of the Janus particles, we have developed a simple and versatile method to synthesize Janus particles by taking the advantage of Pickering emulsions with particles adsorbed at interface. This method can be easily scaled up to synthesize Janus particles in large quantity. And the embedment of particles at the wax surface can be tuned by adding opposite charged surfactant molecules during the emulsification. In this way, the geometry of Janus particles can be controlled.

With the synthetic methods at hand, the self-assembly structures of Janus amphiphilic particles were investigated. It is found that Janus amphiphilic particles will self-assemble into interesting cluster and chain structures in aqueous solutions. These structures are dynamic and amphiphilic in nature as the micelles formed by small surfactant molecules. We have systematically explored these structures under different salt concentration, particle concentration and Janus geometry.

Enhancing the Optical Transduction of Chemical Forces Using Gold Nanoparticles

Lucas Thompson – Graduate Student, Department of Chemistry



Interest in utilizing plasmonic architectures for sensing applications has flourished over the last decade. Advances in lithographic techniques coupled with a better understanding of how plasmons respond to changes in the dielectric at the interface has allowed for sensors with increased sensitivity. We have developed a nanostructured plasmonic crystal (PC) fabricated by soft lithographic methods that is extremely sensitive to refractive index changes near the metal-dielectric interface. Utilizing a responsive hydrogel coupled to the surface of a PC, we are able to optically detect small changes in pH of a buffered solution in the absence of bulk refractive index changes. The detected changes in the hydrogel states arise from the deprotonation of acrylic acid groups when exposed to basic solutions, which leads to electrostatic repulsion of the acrylate groups, causing an expansion of the hydrogel. In order to enhance this sensitivity, gold nanoparticles (Au NPs) were embedded into the hydrogel. The introduction of the gold nanoparticles into the hydrogel leads to an enhancement of the response due to coupling between the plasmonic modes of the fabricated plasmonic crystal and plasmons supported on the gold nanoparticles. In addition to an overall increase in sensitivity, we also observe an enhancement at visible wavelengths that is significant, which provides a possible route to a colorimetric sensor.

Coffee and cookies will be served

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