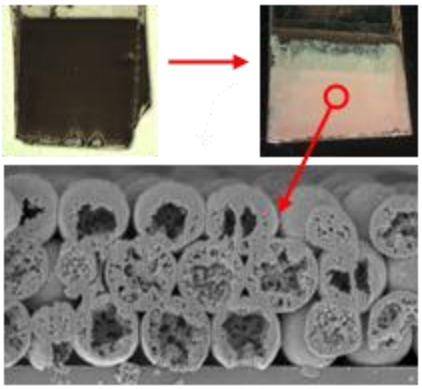
NANOHOUR

Wednesday, October 3, 2012 3:00 pm
Beckman Institute - Room 2269

Orthogonal Colloidal Crystal Templating with Monodispersed, Ultra-high Surface Area Carbon Starburst Spheres

Matthew D. Goodman, Materials Science and Engineering
Graduate Student with Professor Paul Braun

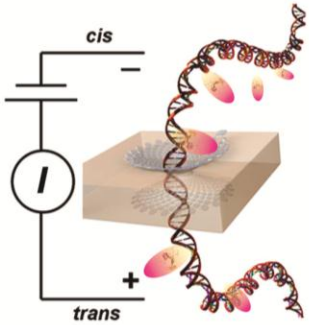


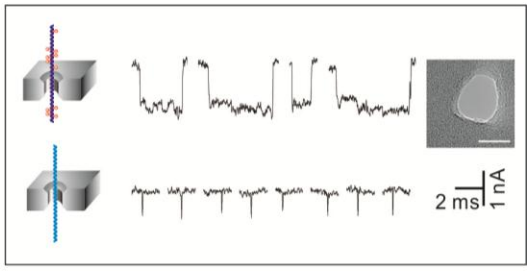
High-temperature, deep infilling Atomic Layer Deposition (ALD) of hafnia and alumina oxides on mesoporous carbon colloidal crystals is demonstrated with an orthogonal carbon removal process, preserving the oxides' nanostructure. Due to carbon's temperature stability (>1000 °C in inert atmosphere), self-assembled carbon opals are ideal templates for materials that can only be grown at high temperatures. In addition, carbon can be removed by oxidation, allowing the templating of materials not resistant to the silica chemical etch conditions (e.g. HF). By tailoring the surface charge, a carbon colloidal crystal can be created for the first time. An extensive and ongoing study on the deposition of materials in the mesoporous carbon, followed by carbon removal, shows different nanostructures between carbon removal via thermal oxidation and oxygen plasma.

Nanopore-Based Analysis on Methylated-DNA with MBD

Dr. Jiwook Shim, Micro and Nanotechnology Laboratory
Postdoctoral Research Assistant with Professor Rashid Bashir

DNA methylation is primary epigenetic modification occurring in eukaryotes and forming by adding methyl group on cytosine without DNA sequence modification. These modifications are involved in transcriptional repression, gene regulation, and human growth. However, aberrant methylation can lead to every type of cancer, and is observed at early and frequently at cancer-specific tumors. Here we report a novel nanopore-based single molecule assay for the detection of methylation in DNA. Having methylated-DNA labeled with methylation binding domain of MBD1 achieves 3 fold larger current blockages in 10 fold prolonged event duration, compared to unmethylated DNA. Interestingly, methylated-DNA bound with a single protein is distinguished with high fidelity of current blockage, and methylated-DNAs which are portion-dependently labeled with protein are characterized with separate event duration. Thereby, nanopore-based assay could coarsely quantify the methylation in DNA. The nanopore-based assay circumvents the laborious processes required for conventional methylation detection methods such as bisulfite conversion, fluorescence labeling and PCR and thereby proves very useful in studying the role of epigenetics in human disease.





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