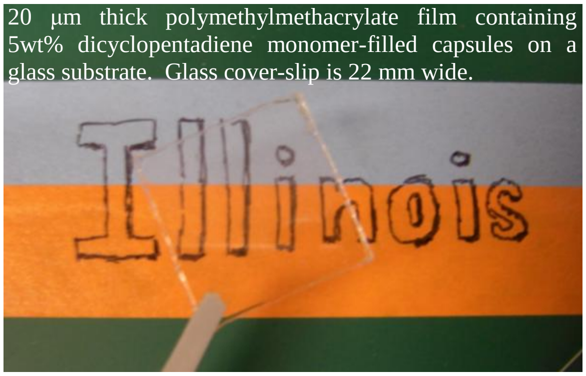
NANOHOUR

Wednesday, December 8, 2010 3:00 pm
Beckman Institute - Room 3269

Self-healing Optical Coatings

Aaron Jackson, Materials Science and Engineering
Graduate Student with Professor Paul Braun

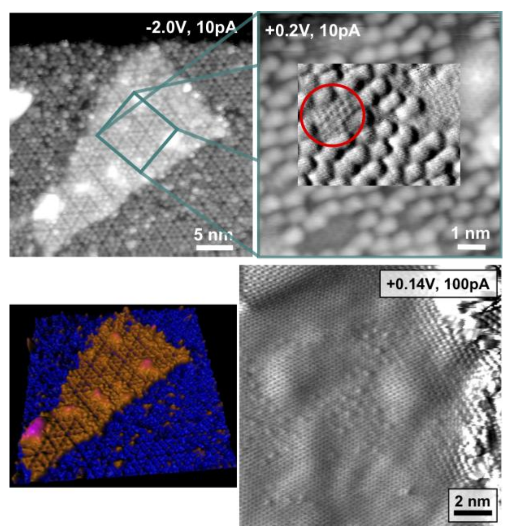


20 μm thick polymethylmethacrylate film containing 5wt% dicyclopentadiene monomer-filled capsules on a glass substrate. Glass cover-slip is 22 mm wide.

Self-healing concepts can be used to improve the lifetime of optical coatings for applications such as lenses and art preservation. In order to develop self-healing optical materials, scattering must be limited from two sources: first, from healing agents incorporated into the optical material; and second, from scratches that have been filled in by the healed material. In order to accomplish this, systems were first considered where the healing agent and the healed material were index matched to the polymer matrix. For capsules containing healing agent, however, the refractive index of the shell wall is not known and can scatter a significant amount of light. This research demonstrates that light scattering can be minimized using a shell wall less than approximately 60nm thick, requiring micron-size capsules. By deploying these capsules in coatings, the scatter that does occur from the shell wall can be limited by the reduced path length. Current work is focused on probing the healing capabilities of this system.

Scanning Tunneling Microscopy Study of Graphene on the Si(111)-7x7 Surface

Justin Koepke, Electrical and Computer Engineering
Graduate Student with Professor Joseph Lyding



The Nobel Prize in Physics this year was awarded for the identification of the exceptional properties of graphene. Graphene is a two-dimensional sheet of sp^2-bonded carbon atoms possessing both extremely high electron mobilities and thermal conductivities. Understanding the electronic and topographic properties of graphene and the atomic-scale graphene-substrate interaction is crucial for any attempting to integrate graphene into future nanoelectronic devices. We use room-temperature ultrahigh vacuum scanning tunneling microscopy (UHV STM) to study nanometer-sized graphene flakes on the Si(111) – 7×7 surface and probe the graphene-substrate interaction at the atomic level. The observed electronic transparency of graphene on this surface as well as the results of scanning tunneling spectroscopy measurements suggest that the graphene-substrate interaction is relatively strong. We also use density functional theory simulations on the combined graphene Si(111) – 7×7 system to further explore the graphene-substrate interaction and compare with experiment.

Coffee and cookies will be served

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