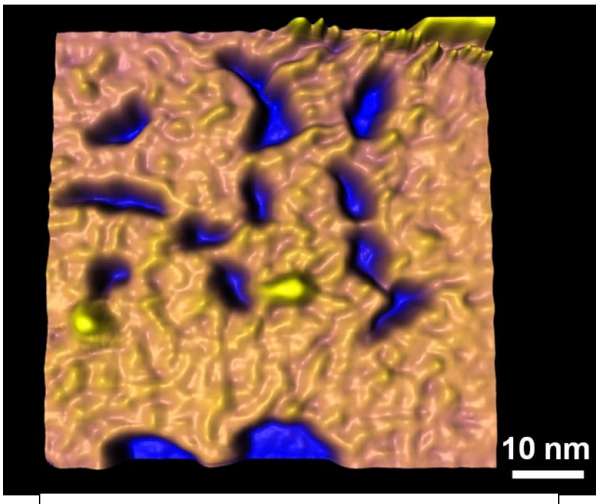
NANOHOUR

Wednesday, May 1, 2013 at 3:00 pm
Beckman Institute - Room 3269

Scanning Tunneling Microscopy Studies of Graphene Interfaces

Kevin He, Electrical and Computer Engineering
Graduate Student with Professor Joseph Lyding

Graphene is a material with impressive electronic, thermal, and mechanical properties, winning the 2010 Nobel Prize in Physics for its myriad of possible applications, both in electronics and beyond. However, many aspects of graphene are still not well understood, and this includes its interactions with various substrates. As a 2D material, many of graphene's properties are directly influenced by the substrate on which it rests, and gaining a better understanding of these interactions is an important step to realizing practical applications for graphene. We use an ultra-high vacuum scanning tunneling microscope (UHV-STM) to electronically characterize the interface between monolayer graphene and several substrates. We also use graphene as an inert coating to study few-layered water at room temperature in vacuum.

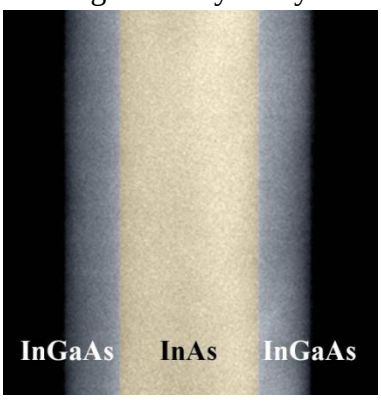


Manipulating water trapped under graphene using the STM tip.

InGaAs Nanowire Arrays Grown on Graphene Substrates for Photovoltaic Applications

Dr. Parsian Mohseni, Electrical and Computer Engineering
Postdoctoral Research Associate with Professor Xiuling Li

Semiconductor nanowires (NWs) are ideal candidates for low cost and high efficiency third generation photovoltaics. They offer inherent light trapping properties, which help to minimize reflection losses, and can be grown in coaxial geometries, which allow for more efficient collection of photo-generated carriers, as compared to conventional film-based solar cells. In this talk, we focus on the seed-free metal-organic chemical vapor deposition (MOCVD) growth of high density arrays of vertically oriented InGaAs NWs directly on graphene substrates. We observe a spontaneous phase-segregation phenomenon that forces the preferential formation of InAs-InGaAs core-shell NWs. This phenomenon is attributed to a unique consequence of seed-free van der Waals epitaxy of InGaAs on graphene, as identical seed-free growths of InGaAs on alternative 2-D sheets and seed-mediated growths on graphene both fail to demonstrate phase-segregation. Modification of the growth mechanism allows for the formation axially heterostructured InGaAs/InAs NWs on graphene. This nano-hybrid material is employed in the demonstration of a novel solar cell design, constructed from active pn-junction NWs with graphene back-side electrodes.



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