Georgia Tech

Materials Research Science and Engineering Center

MRSEC SEMINAR SERIES

Chemical modification and bioapplications of graphene

Dr. Jennifer Curtis, Georgia Tech School of Physics

Date: November 30, 2010

Time: 3:00 PM

Location: Marcus Nanotechnology Building

Graphene's extraordinary physical properties and its planar geometry make it an ideal candidate for a wide array of applications, many of which require controlled chemical modification and the spatial organization of molecules onto its surface. In particular, the ability to functionalize and micropattern graphene with proteins is relevant for bioscience applications such as biomolecular sensors, single cell sensors, and tissue engineering. We report a general strategy for the non-covalent chemical modification of epitaxial graphene for protein immobilization and micropatterning. We show that the bifunctional molecule pyrenebutanoic acid-succinimidyl ester (PYR-NHS), comprised of the hydrophobic pyrene and the reactive succinimide ester group, binds to graphene non-covalently but irreversibly. We investigate whether the chemical treatment perturbs the electronic band structure of graphene, using X-ray photoemission (XPS) and Raman spectroscopies. Our results show that the sp^2 hybridization remains intact and that the π band maintains its characteristic Lorentzian shape in Raman spectra. The modified graphene surfaces, which bind specifically to amines in proteins, are micropatterned with arrays of fluorescently-labelled proteins relevant to glucose sensors (glucose oxidase) and cell sensor and tissue engineering applications (laminin). Further, we will share preliminary results demonstrating the solution gating of epitaxial graphene and its use as a pH sensor.