Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Magnetic Oscillations and Landau Quantization in Decoupled Epitaxial Graphene Multilayers*

JOSEPH A. STROSCIO, Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899

A fundamental challenge to the development of a new electronics based on single atomic sheets of carbon, known as graphene, is to realize a large-area production platform that can produce a carbon system with the same intrinsic properties as a single sheet of graphene. Multi-layer epitaxial graphene (MEG) grown on SiC substrates has been proposed as a possible platform to this end [1]. The central question is, Can MEG *behave* as single layer graphene with the same intrinsic electrical characteristics? In this talk we show that MEG graphene on SiC exhibits single layer graphene properties through new tunneling magnetic measurements. The circular motion of electrons in a magnetic field has historically been a powerful probe of the Fermi surface properties of materials. Oscillations in many measureable properties, such as magnetization, thermal conductivity, and resistance, all reflect the Landau quantization of the electron energy levels. In this talk we show the ability to observe tunneling magneto-conductance oscillations (TMCOs) in the tunneling differential conductance as a function of both magnetic field and electron energy. The TMCO arise from *intense* Dirac quantization of the 2-dimensional Dirac electron and hole quasiparticles in MEG grown on SiC substrates. Spatial profiles of the Landau quantization demonstrate the high quality of MEG on SiC with carrier concentrations that vary less than 10% over hundreds of nm. The single layer quantization observed in these multi-layer samples is attributed to observed rotational stacking domains that effectively decouple the carbon layers in MEG on SiC, thereby yielding single layer graphene properties in a large area carbon production method. *In collaboration with Lee Miller, Kevin Kubista, Gregory M. Rutter, Ming Ruan, Mike Sprinkle, Claire Berger, Walt A. de Heer, and Phillip N. First, Georgia Institute of Technology [1] W.A. de Heer et. al., Solid State Comm. **143**, 92 (2007).