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Optical Spectroscopy of Graphene

Prof.Rui He

Prof. Rui He, Prof. He, Rui obtained her B.S. degree from Fudan University in China in 1999. She received her Ph.D. degree in Applied Physics from Columbia University in the US in 2006. After her graduation from Columbia, she joined the Hong Kong University of Science and Technology as a postdoc in the physics department and as a research assistant in the mathematics department. In 2009 she returned to Columbia University where she worked as a postdoctoral research scientist. She joined the Physics Department at the University of Northern Iowa in August 2011. Her research interests include the general area of optical studies of nanostructures including atomic layers of graphene, molecular layers of organic semiconductors, topological insulators of reduced dimensions, and low-dimensional dichalcogenide crystals.

Abstract : Interest in graphene has exploded in recent years following its isolation from graphite crystals, using scotch tape, in 2004. The numerous applications based on the exceptional electronic, optical, and mechanical properties of graphene layers are the real driving forces of graphene research. While the initial discoveries of graphene's unique electronic properties were in exfoliated flakes of graphite, current interest has shifted to large area graphene layers because of their potential applications in contemporary electronics. Chemical vapor deposition (CVD) on transition metal substrates is one of the most convenient methods for growing large area graphene. The growth on a Cu substrate is of particular interest since the catalytic growth process is self-limiting and in most cases produces a single layer. In the first part of my talk, I will present our studies of CVD graphene on Cu single crystal surfaces with different orientations, CVD graphene doped with nitrogen atoms, and CVD-grown twisted bilayer graphene. Using Raman spectroscopy, we have characterized the strain effect of graphene on Cu single crystal surfaces, the electronic homogeneity of nitrogen doped graphene, and the low-energy vibrational properties in twisted bilayer graphene. In the second part of this talk, I will present our recent work on Raman scattering in topological insulator nanostructures. These studies show that Raman spectroscopy is a versatile tool for probing the fundamental properties of novel nanomaterials

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