Chun Ning (Jeanie) Lau
Department of Physics
University of California, Riverside
Riverside, CA 92521Montréal

jeanie.lau@ucr.edu

Quantum Transport in High Mobility Few-Layer Atomic Membranes

Two dimensional materials constitute an exciting platform for investigation of both fundamental phenomena and electronic applications. Here I will present our results on transport measurements on high mobility graphene, MoS_2 and phosphorene devices. In bilayer and trilayer graphene devices with mobility as high as 400,000 cm^2/V, we observe intrinsic gapped states at the charge neutrality point, arising from electronic interactions. This state is identified to be a layer antiferromagnetic state with broken time reversal symmetry. Using a "new" spectroscopy technique for measuring the Landau level gaps, we demonstrate the distinct competing states at filling factor 2 and crossing between symmetry-broken Landau levels. In MoS_2 devices, we apply ionic liquid gating to suspended devices and achieve very high charge density. Finally, I will present our recent results on fabrication of air-stable few-layer phosphorene heterostructures and observation of quantum oscillations in these devices. Our results underscore the fascinating many-body physics in these 2D membranes.

Figures

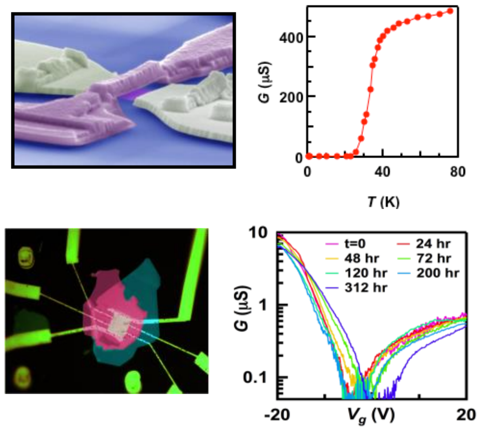

Figure 1: (top) Device image of suspended graphene and presence of an insulating state in trilayer graphene. (bottom). Optical image of a hBN/FLP/hBN hetetrostructure with hall-bar geometry and metal contacts, and device conductance G vs. back gate voltage V_g after extended exposure to ambient environment.