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Atomic hydrogen induced resonant scattering in bilayer graphene

TIANCONG ZHU, JYOTI KATOCH, Department of Physics, The Ohio State University, Columbus, OH, DENIS KOCHAN, Institute for Theoretical Physics, University of Regensburg, Regensburg, Germany, SIMRANJEET SINGH, Department of Physics, The Ohio State University, Columbus, OH, JAROSLAV FABIAN, Institute for Theoretical Physics, University of Regensburg, Regensburg, Germany, ROLAND KAWAKAMI, Department of Physics, The Ohio State University, Columbus, OH — Adatom decoration of the graphene surface is a powerful technique to engineer both its charge and spin related properties. In particular hydrogenation of graphene is interesting due to the possibility of inducing spin orbit coupling, and magnetic moment as well as opening a band gap. Moreover theory also predicts ferromagnetic ordering when hydrogen is adsorbed on the same sublattice. We performed in-situ charge transport study of bilayer graphene devices as a function of successive controlled amount of atomic hydrogen in ultra-high vacuum chamber at low temperatures (20 K). Atomic hydrogen is generated by a thermal gas cracker, and gate dependent resistance of graphene is measured after each atomic hydrogen exposure. On hydrogenation, we observed two additional resistance peaks appear on the electron side of the gate dependent resistance curve. Through DFT calculation and tight binding model, we attribute these two peaks to resonant scattering from hydrogen atoms adsorbed on different sublattices of bilayer graphene. Furthermore, we will discuss the annealing study of the hydrogenated bilayer graphene devices, which indicates the possibility to achieve sublattice selective hydrogenation.

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