Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Tailoring electronic properties in coated graphene BRUNO UCHOA, C.-Y. LIN, N.M.R. PERES, J.M.B. LOPES DOS SANTOS, A.H. CASTRO NETO, Boston University — Graphene is a single layer carbon material whose unique properties in transport are related to the its peculiar Fermi surface, which is made out of six points at the corners of the Brillouin zone where the conduction and valence bands touch. Due to the vanishing density of states at these points, the low energy excitations are made of massless Dirac fermions, with several anomalous properties in the transport. We propose that some of the unique properties of graphene can be tailored by the chemical adsorption of impurity atoms on its surface. If on one hand alkaline metals are good charge donors and can be used to control the number of charge carriers in graphene, transition metals have a more covalent character and can be used to induce magnetism. We show that despite pure graphene cannot be magnetized, the hybridization of the carbon p orbitals with non-magnetic d orbitals can generate strong itinerant magnetism in graphene coated with transition metal atoms. On the other hand, if an isolated impurity atom is able to form a stable localized level under hybridization with the bath of electrons in graphene, we show that the suppression of the density of states in the bath around the localized level can strongly favor the formation of a local magnetic moment at the impurity. We propose that the local magnetization of the impurity can be controlled by the application of an external gate voltage.

Bruno Uchoa
Boston University

Date submitted: 01 Dec 2007 Electronic form version 1.4