Anomalous Phase Breaking in Dilute Fluorinated Graphene

XIA HONG, SHIH-HO CHENG, JUN ZHU, Department of Physics, The Pennsylvania State University — Quantum interference induced weak localization and phase breaking measurements are sensitive tools to probe the existence of magnetic impurities in mesoscopic systems. In this work, we study the low-field magnetoresistance of dilute fluorinated graphene (DFG), with a fluorine adatom density of $\sim 10^{12}/\text{cm}^2$. In the DFG samples, the phase breaking time $\tau_\phi$ follows $T^{-1}$ at high temperature and saturates at $T \sim 10$ K. The former is consistent with electron-electron interaction. The latter cannot be accounted for by conventional theories based on sample size and charge inhomogeneity. We show the dependence of the saturated $\tau_\phi$ on the carrier density and fluorine coverage and discuss the effects of spin-flip scattering and localization in phase breaking. Our observations point to the presence of adatom induced local magnetic moments in dilute fluorinated graphene.

Xia Hong
The Pennsylvania State University

Date submitted: 17 Nov 2010
Electronic form version 1.4