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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 $\sim 10^{12}/\mathrm{cm}^2$. In the DFG samples, the phase breaking time τ_ϕ 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 τ_ϕ 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.

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