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Electric Field Tunable Spin-Flip Scattering in Dilute Fluorinated Bilayer Graphene ADAM STABILE, JING LI, JUN ZHU, Pennsylvania State University — In earlier work, we showed that a dilute coverage of fluorine adatoms covalently bonded to single-layer graphene leads to intriguing and striking phenomena including metal-insulator transition, very large negative magneto-resistance and enhanced spin-flip scattering. By fluorinating only the top layer of a bilayer graphene sheet, this work investigates the possibility of tuning the spin-flip scattering rate *in situ* via a perpendicular electric field D. Dual HfO_2 gated field effect transistors of dilute fluorinated bilayer graphene (DFBG) (F:C 0.03 %) are used, in which we independently control D and the carrier density n. The n-dependence of the conductance exhibits signatures of midgap state scattering. The midgap states also lead to increased conduction in the band gap of biased DFBG. Magneto-resistance measurements and weak localization analyses over a wide range of n, temperatures, and D-fields indicate the presence of spin-flip scattering, similar to what is observed in dilute fluorinated single-layer graphene. Most strikingly, the spin-flip rate can be tuned by over a factor of 2 via controlling the direction and magnitude of the D-field. These results demonstrate the potential of DFBG in spintronic applications.

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