Graphene-based magnetic tunnel junctions
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Graphene’s in-plane transport has been widely researched and has yielded extraordinary carrier mobilities of $10^5$ cm$^2$/Vs and spin diffusion lengths of exceeding 100$\mu$m. These properties bode well for graphene in future electronics and spintronics technologies. Its out-of-plane transport has been far less studied, although its parent material, graphite, shows a large conductance anisotropy. Recent calculations [1,2] show graphene’s interaction with close-packed ferromagnetic metal surfaces should produce highly spin-polarized transport out-of-plane, an enabling breakthrough for spintronics technology. In this work, we fabricate and measure FM/graphene/FM magnetic tunnel junctions using CVD-grown single-layer graphene. The resulting junctions show non-linear current-voltage characteristics and a very weak temperature dependence consistent with charge tunneling transport. Furthermore, we study spin transport across the junction as a function of bias voltage and temperature. The tunneling magnetoresistance (TMR) peaks at two percent for single-layer graphene junctions and exhibits the expected bias asymmetry and a temperature dependence that fits well with established spin-polarized tunneling models.

[3] Results of multi-layer graphene tunnel junctions will also be discussed.

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