SEMINARIO

Induced magnetism in 2D-materials via proximity effect with ferromagnetic insulators

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The recent discovery of the quantum anomalous Hall effect (QAHE) in magnetically doped topological insulators cooled below the milikelvin regime represents breakthrough in the field of spintronics (1). Theoretically, the QAHE should occur in graphene proximity coupled to a ferromagnetic insulator (2) but with the promise of much higher operating temperatures for practical applications.

Hints of proximity-induced magnetism in graphene coupled to yttrium iron garnet (YIG) films have been reported (3) although the QAHE remains unobserved. The lack of a fully developed plateau in graphene/YIG devices can be attributed to poor interfacial coupling and therefore a dramatically reduced magnetic proximity effect.

I will report on the deposition and characterisation of epitaxial thin-films of YIG on lattice-matched gadolinium gallium garnet substrates by pulsed laser deposition. Pristine exfoliated graphene flakes transferred mechanically onto the YIG are reported alongside results that correlate the effects of YIG morphology to the electronic and crystal properties of graphene by electrical (low temperature magnetoresistance measurements in Hall-bar-like configuration) and optical (Raman) means.

(1) C.Z. Chang et al., Science 340, 167 (2013) and C.Z. Chang et al., Nature Materials 14, 473 (2015).

(2) C. L. Kane and E. J. Mele, Phys. Rev. Lett. 95, 226801 (2005).

(3) Z. Wang et al., Phys. Rev. Lett. 114, 016603 (2015).