Novel magnetic proximity effect in vertical structures of 2D ferromagnets and graphene

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Magnetic proximity effect is very often portrayed as a spin splitting induced in the energy levels of a non-magnetic material because of its exchange interaction with an underlying magnetic material. The resulting spin splitting might lead to spin-dependent properties in the non-magnetic material. In this talk I will discuss a new class of magnetic proximity [1] effect that is based on a spin dependent hybridization of the electronic states at the Fermi energy of a non-magnetic conductor with a flat spin-polarized band of a ferromagnetic insulator. In the case of a conducting non-magnetic 2D crystal, spin dependent hybridization with a ferromagnetic insulator can opens up a gap in one spin channel only, resulting in a half-metal. I will illustrate this effect in the case of Dirac electrons in monolayer graphene with the spin-polarized flat conduction band of a monolayer CrI_3 [2]. I will show that an off-plane electric field controls the hybridization and I will discuss a very efficient spin valve based on hybridization proximity.

References

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