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TÉMA

Proximity effects induced by exchange and spin-orbit coupling at intefaces: graphene on metals and metal-organic coordination networks on topological insulators

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Spin interactions in clean graphene are rather weak due to the weakness of spin-orbit coupling. However, graphene functionalization with adatoms and/or molecules permits to enhance both exchange and spin-orbit couplings in a controlled manner by a proper choice of adatoms, like 3d transition metal atoms to enhance exchange fields and heavy atoms (Pb or Bi) to enhance spin-orbit interactions. In this talk, I will discuss two particular cases of graphene-metal interfaces, both of them with an Ir(111) metal surface as supporting material: (i) graphene/Fe-Ir(111) at varying Fe concentration of the top-most Fe-Ir(111) layer, and (ii) graphene/Pb/Ir(111) with Pb atoms intercalated between graphene and Ir(111).

Apart from graphene, another interesting type of two dimensional systems to be used in the design of spintronic devices based on heterostructures are metal-organic coordination networks (MOCNs) made of 3d transition metal atoms and organic ligands. In the particular case of ferromagnetic coupling between the spin of the 3d metal atoms and out-of-plane magnetization, the growth of such a MOCN on top of a topological insulator (TI) is expected to modify its electronic structure by inducing a sizeable magnetization on the top most layer atoms of the TI that translates into the opening of a gap a the Dirac cone, something that would permit the observation of the quantum anomalous Hall effect in such systems.

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