Departamento de Física de Materiales

SEMINARIO

TUNABLE PROXIMITY EFFECTS IN CUPRATE SUPERCONDUCTOR/GRAPHENE JUNCTIONS

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Superconductivity induced by proximity effect is particularly interesting in graphene. For example, because of the conduction and valence bands touching at the Dirac point, an unusual form of the Andreev reflection (the so-called specular Andreev reflection) has been predicted theoretically to happen at a superconductor/graphene interface [1]. We have fabricated cuprate superconductor/graphene planar junctions using a combination of lithography, ion irradiation and CVD graphene transfer techniques. The conductance measurements show that the interfaces are transparent such that the electrical transport is governed by Andreev reflection. The devices allow the modulation of graphene doping via either a top or a back gate, and thus enable electrical control of the graphene's Fermi energy. This allows us to evidence superconducting electron interference effects that constitute an analogue of Klein tunneling for superconducting pairs. The interference effects periodically modulate the conductance across the junction. We perform numerical simulations based on the model developed in [2]. We compare this simulated superconductor graphene interface conductance to the experimental conductance. We will also present recent work on nanometric cuprate superconductor/graphene junctions where we observe conductance oscillations with bias voltage. These oscillation period decrease when increasing the graphene channel length which indicates that the interferences happen inside the graphene channel.

References:
[1] C. W. J. Beenakker, Phys. Rev. Lett. 97, 067007 (2007)
[2] J. Linder, A. Sudbo, Phys. Rev. Lett. 99, 147001 (2007)