# Unipolar supercurrent through graphene grafted with Pt-Porphyrins: Signature of gate voltage dependent magnetism

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The superconducting proximity effect is a sensitive probe of mesoscopic systems. Here we show how it can detect a magnetic order induced in graphene. We have grafted graphene with Pt-porphyrin molecules which interact with graphene's delocalized electrons. Neutral Pt-porphyrins are non-magnetic, but the ionized form carriers a magnetic moment of roughly one Bohr magneton. At room temperature we find that the molecules electron-dope the graphene and there is a hysteresis in gate voltage, demonstrating that electron transfer occurs. More surprisingly, the grafted graphene's mobility increases. At low temperature, we show how superconducting contact electrodes can uniquely reveal the magnetic order induced in a mesoscopic, one micron-long graphene sheet. The unipolar nature of the induced supercurrent, which is enhanced at negative gate voltage but suppressed at positive gate voltage, may be the evidence for the Fermi-level controlled exchange interaction between localized spins and graphene. We have also found signatures of magnetic moments in graphene grafted by porphyrin using non superconducting contacts, most notably in the asymmetric magnetoresistance in parallel field.

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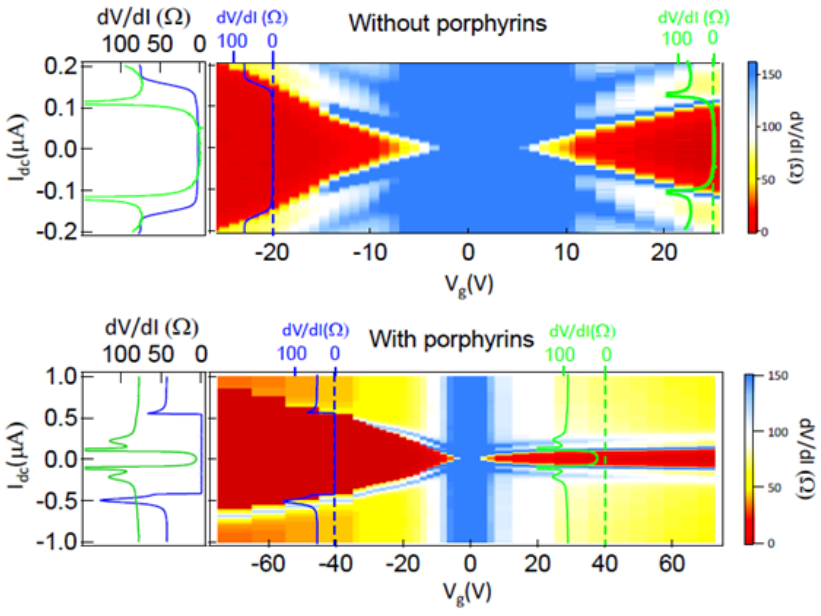
**References**

Chuan Li, Katsuyoshi Komatsu, G. Clave, S. Campidelli, A. Filoramo, S. Gueron, H. Bouchiat, arXiv:1304.7089

**Figure**




Caption : **Comparison between the proximity effect in graphene connected to Pd/Nb electrodes before (upper) and after (lower) deposition of porphyrin molecules**