Hysteresis loops of the magnetoconductance in graphene devices

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We report a systematic study of the low temperature magnetoconductance of various graphene devices with the field applied in the plane of graphene. At temperatures below 1K, the magnetoconductance signal depends on the gate and its sign is related to universal conductance fluctuations. When the field is swept at high enough rates (dB/dt > 10mT/s) a hysteresis is observed in the signal. We have systematically measured different devices of various sizes, form unpatterned large flakes down to narrow ribbons (50nm large) and constrictions (30nm in width), finding that the magnetic signal does not depend on the size nor on the transport regime of the device. We attribute the origin of the signal to the magnetization reversal of paramagnetic centers in graphene, which might originate from structural defects in the graphene layer, most probably vacancies [1]. Based on the field and temperature dependencies of the hysteresis, we conclude that the spin of the localized moments is higher than $S = 1/2$, in agreement with recent works[2,3].

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References

[1] A. Candini et al. accepted for publication in Phys Rev. B (2011) and selected as an Edotor's Suggestion. Available online at: arXiv:1101.3030v1
[2] M. Sepioni et al., Phys. Rev. Lett. **105**, (2010) 207205
[3] D.W. Boukhvalov et al., arXiv:1012.3828v1 (2010)

Figures

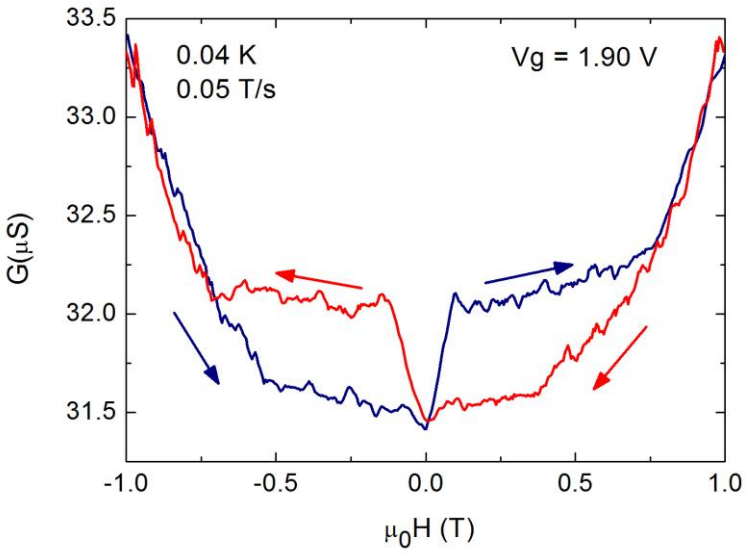

Fig1: Parallel magnetoconductance of a graphene device for a fixed gate voltage, taken at 0.04 K and at a field sweep rate of 0.05 T/s. The hysteresis is clearly visible. Figure taken from reference [1].