Annealing-induced magnetic moments in epitaxial graphene detected by spin precession measurements

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Epitaxial graphene grown on SiC presents a viable route towards large-scale integration of graphene-based spintronics devices. Recently, two experimental groups realized spin transport in epitaxial graphene, but with vastly different spin relaxation times in different measurement configurations [1,2]. Also, the material system SiC/graphene seems much more complex than exfoliated graphene, and localized states can influence spin transport [3]. This motivated our experimental study of spin transport in epitaxial graphene before and after annealing at 150 °C in vacuum. Surprisingly, even these moderate conditions lead to considerable modifications in spin transport. We observe a reduction of the spin relaxation time and length upon annealing and, at first sight, a discrepancy between the charge diffusion constant and spin diffusion constant. This can be resolved by assuming local magnetic moments, which were shown to lead to an enhanced effective g-factor [4]. Here we also present the temperature dependence of the effective g-factor, which shows a 1/T-dependence, as expected for paramagnetic moments [5].

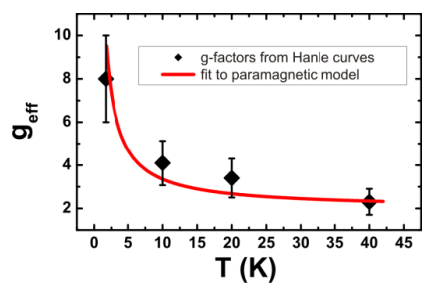

Figure 1: Temperature dependence of the effective g-factor after annealing

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