Spin Transport in Graphene

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Abstract

Graphene, a 2-dimensional material which consists of a single sheet of carbon atoms, is believed to have a low spin orbit interaction, i.e., a long spin life time. Combined with the high charge carrier mobilities this implies a long distance over which the spin information can be transported (long spin relaxation length). As a first step towards graphene spintronics, we studied spin transport in graphene field effect transistors [Tombros *et al.*, Nature **448**, 571]. The spin valve signals and the precession measurements reveal a spin relaxation length of 1.5 to 2 micrometers. The spin signals were found to be weakly dependent on temperature (4.2K, 77K and room temperature) or the charge carrier density (Dirac point and high electron/hole densities). We also find that the presence of a thin aluminum oxide layer on top of graphene (due to the fabrication procedure) does not influence the spin transport significantly. Additionally, we studied the influence of the initial spin orientation, parallel or perpendicular to the plane of graphene, on the spin relaxation.