Magnetoresistance in CVD-graphene on SiC

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We investigate the electrical properties of graphene grown by Chemical Vapor Deposition (CVD) on the Si face of SiC substrates [1]. Magnetoresistance measurements have been performed under magnetic field in a wide temperature range. Depending on the growth condition, hole or electron doping can be achieved, down to a few $10^{11}cm^{-2}$. Our CVD graphene samples are either standard epitaxial monolayer graphene on top of a ZLG and it corresponds to *n*-doped samples, or quasi-free standing graphene above a hydrogenated SiC substrate, where the ZLG is absent and it corresponds to *p*-doped samples [2].

In this talk, we examine the magnetoresistance results (for *p- and n- doped samples*) at intermediate magnetic field between weak localization and Landau quantization regimes to perform a systematic study of electron-electron interaction (EEI) [3]. Our work distinguishes the effect of EEI from additional quantum corrections to the longitudinal resistivity for arbitrary temperature. Furthermore, our results demonstrate a transition from the diffusive to the ballistic regime. This transition is not attributed to a modification of the number of multiplet channels participating to EEI due to inter- and intra- valley scattering.

In graphene, EEI is specifically sensitive to the type of disorder which depends on both the graphene quality and the characteristics of the environment. Our analysis of EEI, more specifically in ballistic regime, is helpful to give an indication of the nature of disorder in grapheme. To describe our data, we rely on a recent theory [4] which predicts the EEI correction at all temperatures for both short- and long-range disorder.

References

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