Carrier mobility and weak localization in rippled graphene

Maciej Zwierzycki[1]

[1] *Institute of Molecular Physics, Polish Academy of Sciences,*
Smoluchowskiego 17, 60-179 Poznań, Poland

Graphene, a two-dimensional honeycomb lattice of carbon atoms, is often depicted as ideally flat plane. In reality both graphene on substrate and suspended samples typically exhibit ripples. The out-of-plane deviation is usually in the range of few Ångströms and lateral wavelengths range between tens and few hundreds nanometers. Scattering on ripples may be one of the factors limiting the mobility of the charge carriers and also lead to the suppression of the weak localization seen in some of the samples. In the paper, the transport properties of rippled graphene are studied using using single-band tight-binding model. Both the bond-length variation, and fluctuating scalar potential are included in the formalism. The samples are modeled as self-similar surfaces characterized by the roughness exponent with values ranging from typical for graphene on SiO_2 to those seen in suspended samples. The range of calculated resistivities and mobilities overlaps with experiment [1]. Additionally, the magnetoconductance is calculated for samples featuring both ripples and resonant impurities, modeled as vacancies. The results demonstrate the suppression of weak localization already for very small out-of-plane amplitudes of the ripples.

[1] M. Zwierzycki, J. Phys.: Condens. Matter **26** (2014)