Transport properties of rippled graphene

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The interest in graphene, a single plane of carbon atoms forming a honeycomb lattice, is both fundamental and practical. The peculiarity of its electronic structure, consisting near Fermi energy of a massless Dirac fermions, gives rise to the range of novel phenomena like minimal conductivity, Klein paradox, or the anomalous Quantum Hall Effect. At the same time the high (exceeding 10^5 cm^2/Vs) mobility of its carriers which number and character can be controlled either by electric or chemical doping makes graphene a potential candidate for application in ultrafast electronic devices. While it is common to describe graphene as ideally flat plane, there exists both theoretical end experimental evidence that it is most usual to find it in a rippled state. The ripples can be either induced by the substrate or formed spontaneously in suspended graphene. The lateral size of such features ranges between several and tens of nanometers with the height of up to 1 *nm*. It has been suggested that the presence of ripples could be one of the factors ultimately limiting mobility of carriers and that it may be also responsible, by introducing an effective gauge field, for the lack of weak localization observed in certain graphene samples. In the present contribution we theoretically study the transport properties of the rippled graphene starting with the simple case of one dimensional modulation. Using either single-band or the full sp^3 tight-banding Hamiltonians we compare and discuss the importance of two ripple-related mechanisms of scattering: the variation of interatomic distances and hybridization between π and σ bands of graphene.

9.7 cm

13.4 cm

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