Fold assisted transport in graphene systems

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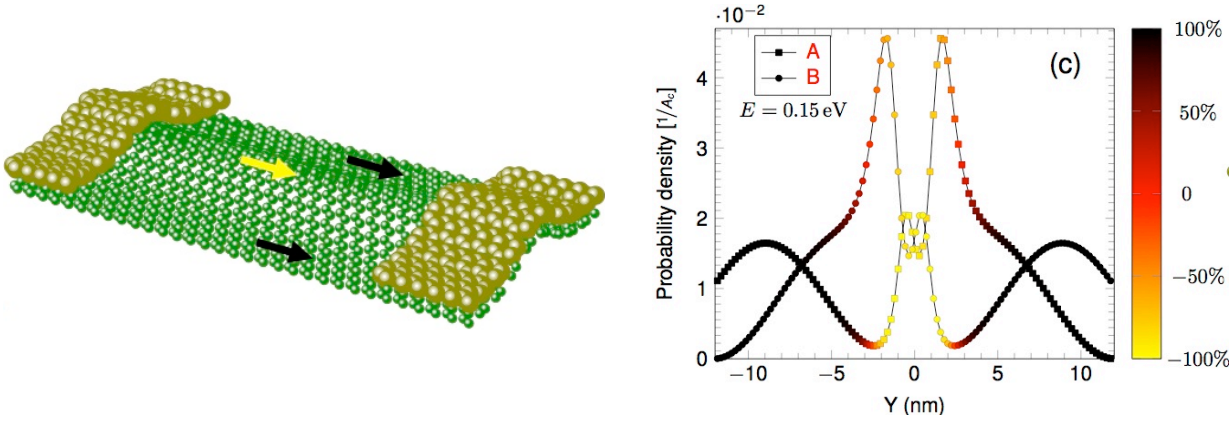
Abstract

Deformations in graphene are central elements in the novel field of "straintronics". Various strain geometries have been to produce specific properties but their experimental realization has been limited. Because folds occur naturally in graphene samples, or could be engineered with appropriate substrates, we study their effects on graphene transport properties [1]. We show the existence of an enhanced local density of states (LDOS) along the fold that originates from localization of higher energy states, and provides extra conductance channels at lower energies. In addition to exhibit sublattice symmetry breaking, these states are valley polarized, with quasi-ballistic properties in smooth disorder potentials. We confirmed that these results persist in the presence of strong edge disorder, making folds viable electronic waveguides. These findings could be tested in currently available experimental settings.

References

[1] R. Carrillo-Bastos et al., arXiv:1604.00732. (2016)



Figures 1: (a) Schematic representation of a graphene nanoribbon with a Gaussian fold deformation. (b) Total LDOS for states with same velocity near both K and K' valleys. Color scale represents percentual contribution from each valley; yellow refers to states near K and black to states near K'. Notice that arrows in (a) represent valley polarized current along the ribbon, with colors defined as in (b).