Controlling the localization of topological gapless states in bilayer graphene with a gate voltage

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Bilayer graphene with stacking domain walls is known for having topologically protected gapless states when gated. If only the transition between the domains is defectless, the two states exist on each valley [1, 2]. Their number may be related to topological properties of the two domains. The origin and exact localization of such states, however, require more detailed study. We investigate these gapless states using atomistic lattice models, which permit to study their origin by following the formation of carbon bonds between layers. More importantly, we analyze the layer localization and show that it depends on the ratio of the gate potential to the interlayer hopping [3]. Two different regimes are thus defined for small and large gate voltages that may open a route for the use of topologically protected states in practical devices.

References

[1] Pelc et al. Phys Rev. B 92, 085433 (2015)
[2] Jaskólski et al. Nanoscale 8, 6079 (2016)
[3] Jaskólski et al. 2D Materials 5, 2 (2018)

Figures

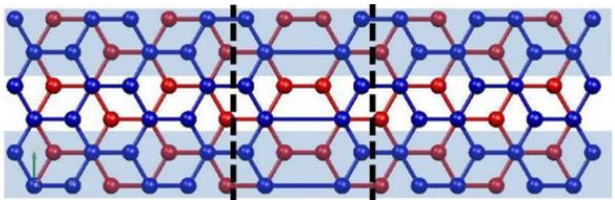

Figure 1: Bilayer graphene with stacking domain wall

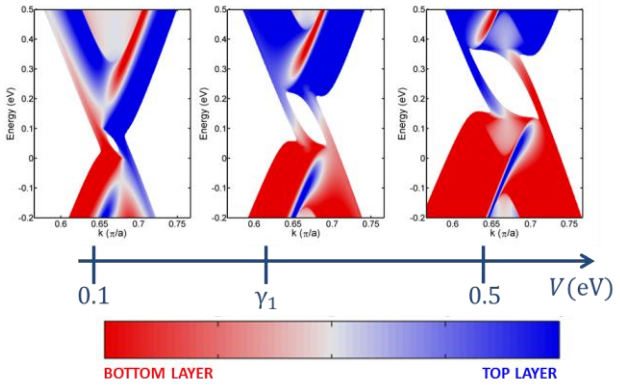

Figure 2: Layer localization dependence for different gate voltage magnitudes.