Electronic transport in graphene nanoribbons with sublattice-asymmetric doping

Recent experimental findings and theoretical predictions suggest that nitrogen-doped CVD-grown graphene may give rise to electronic band gaps due to impurity distributions which favor segregation on a single sublattice. Here, we demonstrate theoretically that such distributions lead to more complex behavior in the presence of edges, where geometry determines whether electrons in the sample view the impurities as a gap-opening average potential or as scatterers. Zigzag edges give rise to the latter case, and remove the electronic band gaps predicted in extended graphene samples. We predict that such behavior will give rise to leakage near grain boundaries with a similar geometry or in zigzag-edged etched devices. Furthermore, we examine the formation of one-dimensional metallic channels at interfaces between different sublattice domains, which should be observable experimentally and offer intriguing waveguiding possibilities.