Vertical Heterojunctions Based on Ferromagnetic Graphene and Ferroelectric Tunnel Barrier

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Abstract
Numerous studies of graphene-based vertical heterostructure have been devoted to the electronic applications making use of the extraordinary properties of graphene. Such layered structures have been proposed as a prototype field-effect transistor by using vertical quantum tunneling.[1,2] Since the range of possible candidates is almost infinite in nature, there are many combinations of layered materials to create novel heterostructures.
Here, we predict the emergence of giant resistance in a vertically stacked heterojunction based on ferromagnetic graphene (FMG) with spin-resolved band structures. [3] We investigate tunneling current characteristics through atomically thin insulating layer sandwiched by two FMGs. Owing to the spin-resolved band structures of FMG, spin configuration of FMGs can be controlled by electric fields, and quantum tunneling through FMG heterojunctions can be suppressed by giant electroresistance in ferroelectric tunnel junctions. [4]

References

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Figures

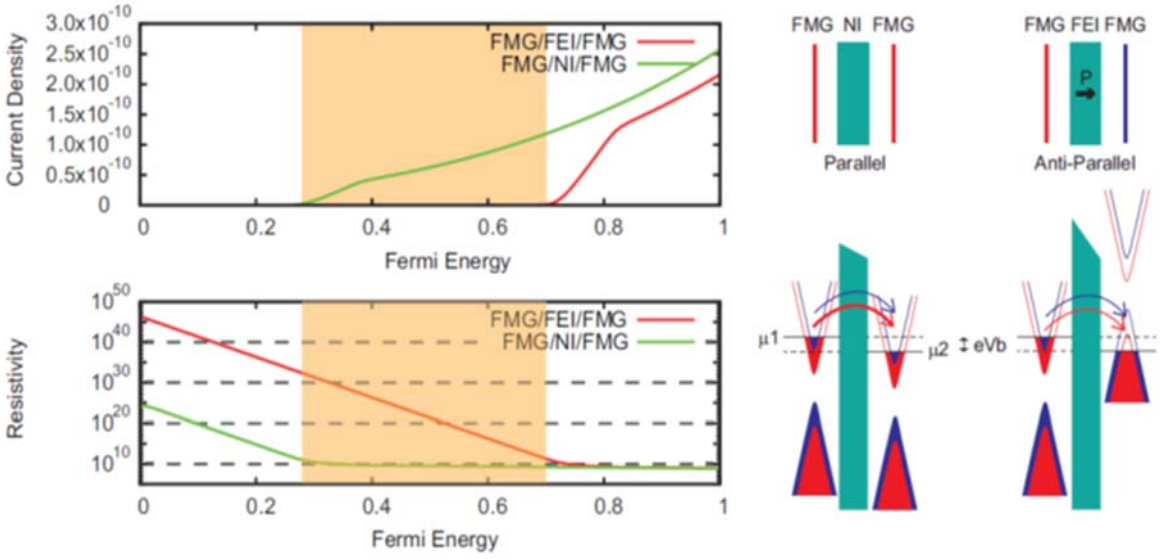

Fig. 1. Emergence of giant resistance in FMG/FEI heterojunctions. The blockade of quantum tunneling through the heterojunction originates from the anti-parallel configuration of FMGs.