Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Misalignment and Disorder in Graphene Bilayers and Nanoribbons: Electronic-structure and Electric-field modulation HASSAN RAZA, ECE University of Iowa — In Bernal stacked bilayer graphene, the coupling between the two layers is a function of the stacking distance [1] as well as the relative orientation of the two layers. We computationally study the effect of stacking misalignments on the electronic structure and electric-field modulation using the extended Hückel theory. We report that certain stacking misalignments, either induced from adjacent dielectrics or stress, would lead to various characteristics of electronic-structure and out-of-plane electric-field modulation, which can have a significant effect on the band gap opening. Furthermore, we study the impact of edge disorder in armchair and zigzag graphene nanoribbons on their electronic-structure for semiconductor applications. Due to disorder, the quantized transverse momentum does not cross the Dirac point and hence a semiconducting system is observed. We further study the bandgap modulation [2] by a transverse electric-field for these disordered nanoribbons.

[1] H. Raza, E. C. Kan, J. Phys.: Condens. Matter 21, 102202 (2009).
[2] H. Raza, E. C. Kan, Phys. Rev. B 77, 245434 (2008).

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Date submitted: 11 Dec 2009 Electronic form version 1.4