Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Effects of Non-Ideal Edges in Graphene Nanoribbons[1] D. BASU, M.J. GILBERT, L.F. REGISTER, S.K. BANERJEE, Microelectronics Research Center, The University of Texas at Austin, A.H. MACDONALD, Department of Physics, The University of Texas at Austin — We report quantum mechanical transport simulations of the edge effects of nanoribbons of two-dimensional (2D) graphite sheets or graphene. Semiconducting graphene nanoribbons have the potential to augment Si technology because of their excellent electronic properties. In practice we find that scattering from the vacant sites in an otherwise perfect armchair edge of graphene reduces its transmission characteristics drastically. These effects decrease as the widths of the ribbons increase and as the number of steps along the edges decrease. However, band gap of these semiconducting graphene decreases as the width increases, leading to an increase in the band-to-band leakage current. We conclude that without atomic precision to define perfect edges, it may not be practical to use very narrow graphene layers as a semiconducting material for field effect transistors (FETs). Our tight-binding treatment of vacancies allows us to study not only FET-like devices, but also the effect of disorder that breaks symmetry in the graphene sheet for more exotic applications such as pseudospin-type devices.

[1]This work was supported in part by the NRI SWAN Center, DARPA and by SRC.

Dipanjan Basu
Microlectronics Research Center, Univ. of Texas at Austin

Date submitted: 05 Dec 2007 Electronic form version 1.4