Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Effects of electric fields on energy gap in bilayer graphene nanoribbons[1] Y.C. HUANG, S.J. CHIOU, P.L. HUANG, S.F. YANG, C.L. LU, CENTER FOR GENERAL EDUCATION, KAO YUAN UNIVERSITY. TEAM —
Electronic properties of bilayer graphene nanoribbons are investigated by using the tight-binding model with transverse electric fields. They are mainly determined by the external fields, the ribbon edges, and the ribbon width (N_y). All bilayer zigzag ribbons are semiconductors, while bilayer armchair ribbons are semiconductors for $N_y \neq 3I+2$ (I an integer). The electric fields modifies the energy dispersions, alters the subband spacing, switches the band gap (E_g), and causes the semiconductor-metal (or metal- semiconductor) transitions. In bilayer zigzag ribbons, electric fields not only lifts the degeneracy of partial flat bands at E_F but also switches off E_g. E_g is dependent on the ribbon width, ribbon edges, and the field strength. The semiconductor-metal transitions occur in both armchair ribbons and zigzag ribbons in the increase in electric fields. Due to electric fields, the above-mentioned effects are completely reflected in the features of density of states, such as the generation of special structures, the shift of peak position, and the alternation of band gap. The predicted electronic properties could be verified by scanning tunneling microscope conductance and optical absorption measurements.

[1]This project is financially sponsored by NSC (97-2112-M-244-001-MY2).

Y.C. Huang

Date submitted: 30 Nov 2009 Electronic form version 1.4