CENTER FOR NANOHYBRID FUNCTIONAL MATERIALS,
NEBRASKA CENTER for MATERIALS and NANOSCIENCE,
UNL PHYSICS and ASTRONOMY DEPT.
present

MONDAY
OCT. 14, 2013
4:00 P.M.
136 JORGENSEN HALL - UNL

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Direct Graphene Growth on Oxides and Nitrides: Towards Practical Charge and Spin Devices

The direct growth of graphene on dielectric substrates, using industrially scalable methods, including chemical vapor deposition or molecular beam epitaxy (CVD, MBE) is an essential step towards the development of practical graphene devices. The factors determining graphene epitaxy on dielectric substrates are not well understood, and lattice matching appears to be important in some cases but not in others. In cases where such direct growth has been achieved, however, the substrate critically impacts the electronic or magnetic properties of the single or few layer graphene film. This includes substantial n-type doping for CVD graphene/BN(0001)/Ru(0001), band gap (~ 0.5-1 eV) formation for CVD graphene/MgO(111), and significant p-type doping and substrate-induced spin-polarization at and above 300 K for MBE graphene/Co_3O_4(111)/Co(0001). The prospects for practical, manufacturable devices based on these and similar graphene/dielectric heterojunctions will be discussed, including the roles of band gaps in spin and charge FETs, and the relationships between interfacial chemistry and resulting electronic and magnetic properties.

Acknowledgements This work was supported by the Semiconductor Research Corporation-Global Research Consortium under Tasks 2123.001 and 2358.001, and by the StarNet CSPIN Center under Task 2381.002. Vigorous and essential collaborations with the Schubert, Binek and Dowben groups at UNL are gratefully acknowledged.

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