NANOHOUR

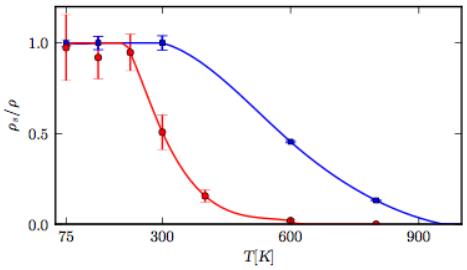
Wednesday, May 4, 2011 3:00 pm
Beckman Institute - Room 3269

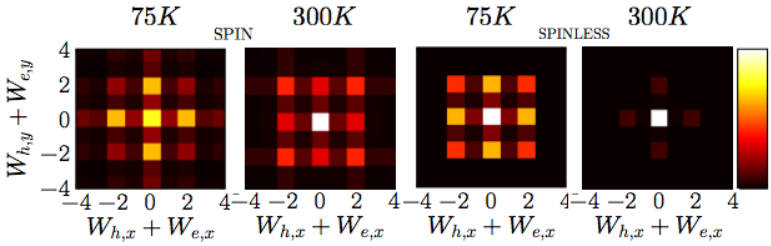
Spin Effects in Dipolar Fluids

Dr. M. Y. Alaoui Lamrani (Bouadani), Electrical and Computer Engineering

Postdoctoral Research Associate with Professor Matthew Gilbert

The literature on CMOS devices is witnessing a remarkable polarizing debate on the size and role of screening effects in bilayer graphene system. This is a very active research field as it may hold the key to solve the inevitable heat barrier associated with the physical size for current state of the art CMOS based devices. Mean fields' predictions on the Kosterlitz-Thouless temperature(T_{KT}) of the exciton condensate are characterized by $x10^5$ disagreement. Using linear response theory within the framework of Paths Integral Monte Carlo(PIMC), we show that the inclusion of spin species in the Hamiltonian induce an important screening effect. We find a reduction of 52% in the transition temperature resulting in $T_{KT} \approx 304$ K when the layer separation is 0:5 nm with $Si0_2$ dielectric background. This still significant T_{KT} is sustained by many-body effects that were not accounted for in any mean field calculation. We conclude that the inclusion of higher fermionic flavors are critical to understanding the superfluid transition in bilayer graphene.



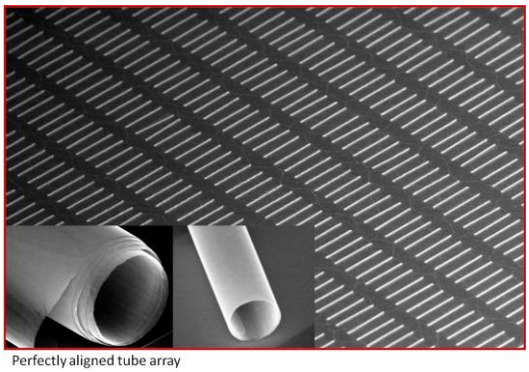


Strain-induced Self Rolled-up III-V semiconductor Micro and Nanotubes

Ik Su Chun, Electrical and Computer Engineering

Graduate Student with Professor Xiuling Li

Strain-induced self rolled-up semiconductor micro or nanotube is a new type of 3D architecture. These tubes are formed when strained semiconductor layers are released from the substrate by selective etching and their positions can be precisely controlled due to the top-down fabrication approach so that the formation of large–area assembly of ordered tubes could be achieved. Tube diameter is determined by the thickness and misfit strain of the epitaxially grown layers by using MOCVD and it can vary from 3nm to tens of micron size. Also, tube wall which consists of different compound semiconductor materials such as GaAs, AlxGa1-xAs and InxGa1-xAs forms heterojunctions so that the optical gain mediums such as quantum well(QW) and quantum dots(QDs) can be embedded in the tube wall. In rolled-up tube structure, strain plays a significant role in engineering the band structure and therefore peak positions in the photoluminescence (PL) spectrum can be tuned continuously as a function of tube curvature. By engineering the tube geometry for better optical confinement, optical resonant modes in the microtube ring cavity can be produced and optically pumped lasing could be achieved. In this talk, I will discuss the formation mechanism of strain-induced semiconductor micro/nanotube, the geometric effect on the tube formation, the strain variation in tubes and optical properties in rolled-up microtube ring cavity.



Perfectly aligned tube array

Coffee and cookies will be served

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