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Einladung zum Vortrag

Mi, 2. März 2011, 11:15 Uhr, Hörsaal für Physik der MUL

Nanoscale Potential Measurements in Pentacene Thin Film Transistors and of Dopant Distribution in Silicon Nanowires

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The first part of the talk will present a comprehensive Kelvin probe force microscopy (KPFM) study of Pentacene thin film transistors with different film thicknesses in combination with current-voltage measurements and three dimensional electrostatics simulations. It is found that in Pentacene films thinner than approximately 30nm, holes are accumulated in the grain boundaries (resulting in upward band bending) induced by negative trapped charge at the SiO_2-Pentacene interface. On the other hand, in films thicker than approximately 30 nm we observe hole depletion (downward band bending) mainly due to charge trapping in the grain boundaries. The results are discussed in view of their effect on Pentacene thin film transistors performance.

In the second part I will describe KPFM measurements of both the longitudinal and radial dopant distribution in doped Silicon nanowires (SiNWs). The results show a non-uniform doping profile along Vapor-Liquid-Solid (VLS) grown *n*-doped SiNWs, and this is explained due to vapor-solid surface doping during their growth inside the reactor. This process also induces very inhomogeneous radial doping profile which was observed via successive chemical etching of a single NW and measuring its surface potential using KPFM. We find that the radial active dopant distribution within a single *n*-type silicon nanowire decreases by almost two orders of magnitude from the wire surface to its core (Figure 1). We show that these non-uniformities can be mitigated by rapid thermal annealing following the growth, and this may pave the way to use Si nanowires as building blocks for a variety of electronic and optoelectronic devices.

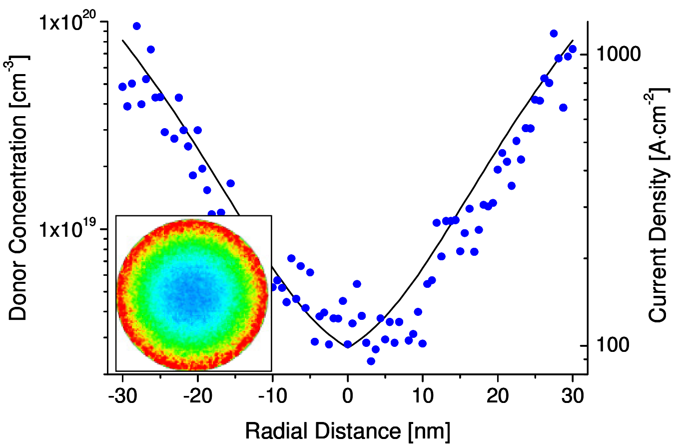

Figure 1: **Calculated current density (dots) passing through the wire having the dopant concentration (line) calculated from the KPFM data ; the inset shows the calculated current density cross section for this dopant distribution.**

* This work is in collaboration with S. Yogev, E. Koren (Tel Aviv), J.K. Hyun, E. Hemesath, and L.J. Lauhon (Northwestern University) and R. Matsubara, and M. Nakamura (Chiba University, Japan)