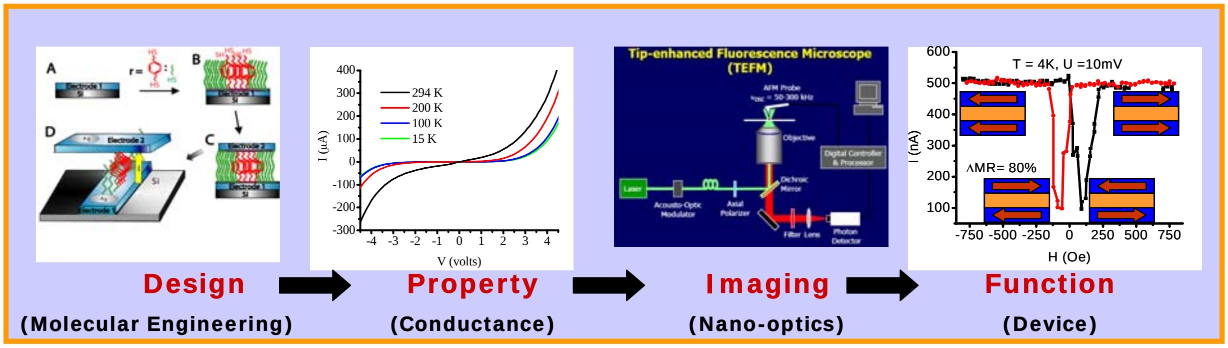

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Advances in Molecular Nanoelectronics:
Phase Transition and Spintronic Studies in Organic Low Dimensional Systems.

Molecular Nanoelectronics is the front area of solid state physics with a wide range of applications in electronics, optics, and biotechnology. This presentation concentrates on the main aspects of my recent research in the field of Molecular Nanoelectronics.

First section *Electrical and optical studies of gap states in self-assembled molecular aggregates* addresses several experimental techniques to study molecular diodes that contain mixtures of insulating and conducting molecules. Electrical measurements, as well as absorption and PL measurements were used to study the molecular sandwiches. We have performed a systematic study on structure-property relationships in low dimensional molecular systems. These systems were based on the self-assembled single molecular wires, (1D approximation) and *self-assembled molecular aggregates* (2D approximation)**.** In addition, fabrication of molecular junctions with different metals electrodes clarified the role of the work function in setting the energy of the gap states.

Second section, *Manipulating spins using spin-valves of self-assembled molecular wires,* is dedicated to the study of spin transport in self-assembled single molecular wires. Spin-valves devices contained self-assembled monolayer (SAM) sandwiched between two ferromagnetic electrodes, namely $La0._{33}Sr_{0.66}MnO_3$ (LSMO) and Co, which have different coercive fields. The relative resistance change, ΔR/R or magnetoresistance (MR), between the device resistance with the electrodes magnetizations parallel and anti-parallel to each other serves as a figure of merit and shows spin injection through the isolated molecular wires. We observed a giant MR of up to 80% at T = 10K. The MR response was measured at various temperatures and biasing voltages to obtain the complete magneto-transport characteristic properties of the organic spin-valve devices.

The final session of this presentation concentrates on the progress in the ongoing research, which is focused on using SWCNTs as nano-electrode for measurements of single molecular transport and as attachment to AFM tip. Attachment of SWCNT to AFM tip should provide future enhancement in Biomolecular Nano-Optics - technique that combines a fluorescence microscope and an atomic force microscope (AFM) for spectroscopic imaging with molecular-scale resolution.

Combination of Electronic, Spintronic and Optical studies along with new Molecular Engineering approaches should result in new generation of Molecular Nanoelectronics devices, followed by better insight of this field.

Sponsored by UAB Department of Physics

Thursday, February 15, 2007

12:30 p.m. – 1:50 p.m.

Campbell Hall 274

Refreshments served at 12:00 p.m. in CH 361