



center for nanophysics
and advanced materials

Condensed Matter Colloquium

Thursday, February 16, 2012

2 pm, Room 1201

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Novel functional oxides and interfaces to the organics

In the quest for new types of information processing and storage, complex oxides stand out as one of the most promising material classes. In particular, multiferroic and magnetoelectric oxides which simultaneously exhibit more than one ferroic order have many advantages over existing materials. In this presentation, I will talk about the hexagonal Lu-Fe-O compound as a novel multiferroic family. The hexagonal LuFeO₃ we studied is a novel multiferroic material stabilized in thin-film form. We demonstrated the long-expected ferroelectricity using piezo-response force microscopy. More interestingly, the hexagonal LuFeO₃ exhibits complex magnetic ordering including weak ferromagnetism above room temperature and spin-canting at 130 K. The combination the ferroelectricity and weak ferromagnetism offers great application potential for this novel multiferroic material. The electronic properties of inorganic/semiconducting polymer (SCP) interfaces dictate the properties of organic electronics and organic spintronics such as organic light-emitting diodes (OLED), organic photovoltaics (OPV), organic photo diodes, and organic spin valves. Specifically, the electronic structure at the metal/SCP interface determines the charge collection of OPVs, the charge injection of OLEDs, and the electronic spin injection of organic spin valves. Unfortunately, there are few degrees of freedom in changing the interfacial electronic structure by varying the working function of the metal and/or the HOMO and LUMO of organic material. On the other hand, by introducing a thin ferroelectric layer, we were able to tune the energy alignment between the metals and organics by controlling the interfacial dipole which is determined by the polarization of the ferroelectric layer. This tunability offers a new route of optimizing the functionality and energy efficiency of the organic electronics and spintronics.

Refreshments at 1:30 pm in **Room 1305F**

