COLLOQUIUM ANNOUNCEMENT

HALF-METALLIC OXIDES FOR SPINTRONICS

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The emerging field of spintronics aims to exploit the electron spin, in addition to its charge, to create a new class of devices that scale down to much smaller dimensions with possibly added functionalities. Of particular relevance are magnetic tunnel junctions (MTJs), consisting of two ferromagnetic thin film electrodes separated by an insulating barrier, that exhibit large tunneling magnetoresistance (TMR) at relatively low fields. The MTJs are promising for a host of applications including magnetic memory (MRAM), sensors and storage devices. Most of the studies on MTJs have thus far focused on using transition metal ferromagnets (Fe, Ni, Co) and their alloys - typically with spin polarization values less than 50% - where the maximum observed TMR is limited to about 40-50% at room temperature using amorphous aluminum oxide barrier. There is obvious interest in further enhancing the TMR by using materials with a higher degree of spin polarization. Half-metallic systems, which contain a gap in one spin band at the Fermi level and no gap in the other spin band, are expected to have a spin polarization value approaching 100%. We have fabricated MTJ devices using half-metallic oxides, such as the mixed-valence manganites ($La_{1-x}A_xMnO_3$, A=Ba, Sr, or Ca) and chromium dioxide (CrO_2), that exhibit reproducible tunneling characteristics with high TMR values. However, the TMR enhancement has thus far been limited to low temperature. I will present an overview of MTJs, particularly related to MRAM application, and then focus on the fabrication and properties of tunnel junctions using the half-metallic oxides and the challenges.

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Thursday, April 12, 2007
12:30 pm-1:45 pm
Campbell Hall room 274

Refreshments served at 12:00 pm in CH 361
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For further information, please contact the
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