Notre Dame Science
Department of Physics

HIGH RESOLUTION PHYSICAL PROPERTY MEASUREMENTS AND HIGH QUALITY MATERIALS:

UNCOVERING THE NATURE OF THE PHASE TRANSITIONS IN $BAFE_2AS_2$ IRON PNICTIDE

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4:00 p.m. NSH 184

The discovery of superconductivity in the iron-pnictides is perhaps one of the most notable and perplexing findings of the decade in the field of condensed matter physics because it reverses the previously held theory that magnetism destroys superconductivity. To date, the "122" series (AFe_2As_2, with A = Ba, Sr, Ca, Eu) is certainly the most systematically studied.

Interestingly, superconductivity can be attained by doping in any of the three atomic sites. As is the case with the other main class of HTCS, cuprates, superconductivity emerges upon suppression of antiferromagnetism (AFM) in a "parent" compound. The AFM transition is accompanied by a tetragonal to orthorhombic structural transition that occurs at the same temperature. This link means that the study of the magneto-structural transition is relevant to understanding the superconductivity itself.

Countless papers have been written on the nature of these transitions, with different probes bringing conflicting evidence for both 1^{st} and 2^{nd} order scenarios. It is well known that an indirect measurement of the order parameter can often be obtained with higher precision than through direct diffraction measurements. I present here an analysis of high resolution heat capacity, susceptibility, X-ray and neutron scattering data taken on high quality crystals that uses the Landau theory of phase transitions to draw a clear conclusion as to the nature of the transition.

Condensed Matter Seminar

All interested persons are cordially invited to attend.