

T_cSUH Bi-Weekly Seminar

Texas Center for Superconductivity at the University of Houston

Prof. Bernd Lorenz

Texas Center for Superconductivity



“Magnetolectric Effects, Spin Frustration, and Ferroelectricity in Multiferroic Manganites”

Friday, November 18, 2005

Room 102, University of Houston Science Center

1:00 p.m. – 2:00 p.m.

Abstract

The interaction between electric and magnetic fields in matter and/or between dielectric and magnetic orders is one of the fundamental problems in condensed matter physics. The magnetoelectric effect that allows the control of magnetic (dielectric) properties by electric (magnetic) fields is of principal physical interest and it bears the potential for the development of a new type of magnetoelectric memory. The topic has attracted renewed interest quite recently with the discovery of the coexistence of ferroelectricity and magnetic orders in multiferroic rare earth manganites. We discuss the complex physical properties of multiferroic RMnO_3 and RMn_2O_5 (R=rare earth, Y) and show that magnetic frustration as well as strong spin-lattice coupling are the origin of a wealth of interesting phenomena such as incommensurate magnetic orders, frustration-induced ferroelectricity, magnetic field control of ferroelectric polarization, etc. The interactions between the Mn spins, the rare earth magnetic moments, and the ferroelectric polarization in these compounds give rise to an unprecedented phase complexity, e.g. as observed in hexagonal HoMnO_3 . In orthorhombic RMn_2O_5 , our high-resolution thermal expansion measurements provide unambiguous proof that the ferroelectric transitions are accompanied by strong structural anomalies resulting in anisotropic lattice strain along the principal crystallographic directions.

Bio

Bernd Lorenz received his Ph.D. degree in Physics in 1975 (University of Leipzig, Germany) and his D.Sc. and “*Facultas Docendi*” in Theoretical Physics in 1991. He worked as a Research Associate at the University of Leipzig (1975-1985), the Institute of High Pressure Research in Potsdam (1985-1990), and as the Head of the High Pressure Physics Group at the University of Potsdam (1990-1996). He spent 15 months at the Colorado State University, Fort Collins, CO as a Visiting Professor in 1993/94. In 1996 Dr. Lorenz joined the Texas Center for Superconductivity at the University of Houston where he is working now as a Research Associate Professor in the High-Pressure Low-Temperature Group. His research interests are in the field of condensed matter physics, including superconductivity, magnetism, ferroelectricity, metal-insulator transitions, etc.

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