

T_cSUH Bi-Weekly Seminar

Texas Center for Superconductivity at the University of Houston

Dr. Milko Iliev

Project Leader, Raman & Infrared Laboratory
Texas Center for Superconductivity
University of Houston



“Magnetic-Ordering-Related Phonon and Crystal Field Anomalies in Rare Earth Manganites”

Friday, October 28, 2005

Room 102, University of Houston Science Center
1:00 p.m. – 2:00 p.m.

Abstract

The complex relationships among the lattice distortions, magnetism, and dielectric and transport properties of rare earth manganites RMnO_3 ($R = \text{rare earth, Y, Sc}$) with both orthorhombic and hexagonal structure are attracting increasing interest. The role of structural distortions is widely recognized, but there are only a few studies on their variation with R and how this affects the spin-phonon and electron-phonon coupling.

The results of recent experiments on the variations with R of the Raman spectra of orthorhombic RMnO_3 ($R = \text{La, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Y}$) will be reported. In this series, with decreasing radius r_R of R ($R = \text{La to Eu}$), the magnetic transition temperature T_N to A-type antiferromagnetic (A-AFM) ordering of Mn^{3+} decreases from ~ 140 K to ~ 40 K. With further decrease of r_R ($R = \text{Gd to Ho}$), however, the magnetic structure below T_N changes from A-AFM to an incommensurate antiferromagnetic one (IC-AFM) with sine-wave ordering of the Mn^{3+} moments. It will be shown that the change of magnetic structure correlates with strong mixing of phonon modes involving in-plane Mn-O stretchings and bendings of MnO_6 octahedra. The strong spin-phonon coupling is evidenced by phonon softening at $T < T_N$ in A-AFM, but not in IC-AFM manganites.

Another promising experimental approach—temperature-dependent crystal field IR spectroscopy—will be discussed and the first results on crystal field anomalies near T_N in hexagonal RMnO_3 ($R = \text{Ho, Er, Tm, Yb}$) will be reported.

Bio

Milko Iliev received his Ph.D. degree in Physics in 1973 at the University of Sofia, Bulgaria, and worked there as assistant, associate, and full professor and Dean of the Faculty of Physics until 1996. During 1976-77 he worked as a postdoctoral researcher and later (1992, 1995) as a visiting scientist in the group of Prof. M. Cardona at the Max-Planck-Institute for Solid State Research, Stuttgart, Germany. Since 1996, Dr. M. Iliev has been a Research Professor and Project Leader in T_cSUH. His research interests are in the field of Raman and infrared spectroscopy of HTS and related materials. He has over 130 publications in peer-reviewed journals.

Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8210 as soon as possible.



TEXAS CENTER FOR
SUPERCONDUCTIVITY