MAR08-2007-006534

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Electromagnons in multiferroics[1]

ANDREI SUSHKOV, Department of Physics, University of Maryland

Multiferroic materials with simultaneous magnetic and ferroelectric order exhibit strong cross coupling between electric and magnetic phenomena. One important new effect is the strong coupling between the low lying magnetic and lattice excitations to produce spin waves that interact strongly with light by acquiring electric dipole activity from the phonons. As a result, these excitations, which are called electromagnons, produce contributions to the static dielectric constant which appear in the ordered phases and that can be manipulated with an applied magnetic field. This appears to be the origin of the giant magneto-capacitance effect observed in these multiferroics. Predicted more than three decades ago, electromagnons were reliably observed only recently. In my talk, I will discuss electromagnons in two classes of multiferroic materials: RMnO3 and RMn2O5 (R = Y, Rare Earth) in which the multiferroicity derives from different mechanisms. Correspondingly the electromagnons in these two materials systems have characteristically different spectra and selection rules. The electromagnon H-T phase diagrams for Eu0.75Y0.25MnO3, TbMnO3, TbMn2O5 will be presented. I will also discuss the outstanding problems in understanding these novel excitations and the prospects for electromagnons in other materials.

[1]Collaboration with H.D. Drew, R. Valdes Aguilar, S.W. Cheong, S. Park, Y.J. Choi, C. Zhang, D. Khomskii, and M. Mostovoy is greatly appreciated. Work supported in part by NSF-MRSEC under grant DMR-0520471.