MAR07-2006-000322

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

Magneto-optical evidence of double exchange in a percolating lattice[1]

LEONARDO DEGIORGI, ETH Zurich

Because of the potential technological applications, materials exhibiting colossal magnetoresistive (CMR) effects are of high current interest in solid state physics. Europium hexaboride (EuB_6) and the well known manganites, for which the onset of ferromagnetism is accompanied by a dramatic reduction of the electrical resistivity, are primary examples, that have intensively been studied. We concentrate on the series of cubic $Eu_{1-x}Ca_xB_6$, which displays interesting correlations between magnetic, transport and optical properties. Substituting Eu by Ca in ferromagnetic EuB_6 leads to a percolation limited magnetic ordering. We present and discuss magneto- optical data of the $Eu_{1-x}Ca_xB_6$ series, based on measurements of the reflectivity $R(\omega)$ from the far infrared up to the ultraviolet, as a function of temperature and magnetic field. Via the Kramers-Kronig transformation of R we extract the complete absorption spectra of samples with different values of x. The change of the spectral weight in the Drude component by increasing the magnetic field agrees with a scenario based on the double exchange model, and suggests a crossover from a ferromagnetic metal to a ferromagnetic Anderson insulator upon increasing Ca-content at low temperatures. This work appeared in Phys. Rev. Lett. 96, 016403 (2006)

[1]Co-Authors: G. Caimi, A. Perucchi, H.R. Ott, V.M. Pereira, A.H. Castro Neto, A.D. Bianchi and Z. Fisk