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Magneto-optical evidence of double exchange in a percolating lattice\textsuperscript{1}
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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)

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