Study of Magneto-Transmission Spectra of La$_{0.7}$Pb$_{0.3}$MnO$_{3-\delta}$ Eпитaxial Thin Film

SIDNEY MALAK, Binghamton University, RYAN CLAYTON-COX, JIRI STEHLIK, JIAN-QING WANG, Binghamton University — Magneto-transmission (MT) of epitaxially grown La$_{0.7}$Pb$_{0.3}$MnO$_{3-\delta}$ was measured. Thermo-Electron Nexus 670 FT-IR spectrometer equipped with an electromagnet was used to obtain IR spectra in the range of 350 to 15000 cm$^{-1}$ in various applied magnetic fields up to 1.0 Tesla. For optimal magneto-spectroscopic measurements in transmission, the studied film had a thickness of 190 nm, with a maximum value up to 80% at 320 K in the colossal magnetoresistance (CMR) effect in 5.5 Tesla. It was observed that the MT scale proportionally with the applied magnetic field and was largest at longer wavelengths below 4000 cm$^{-1}$. In this far infrared range, the maximum observed MT value was 4.0 % at 1.0 Tesla. Beyond FIR range the MT curves monotonically decrease with frequency, until the effect vanishes at 12,000 cm$^{-1}$. Such crossover of magneto-spectroscopic responses from IR to optical frequencies is the first evidence of gradual disappearance of the magneto-dynamics at higher frequencies. Compared with the CMR effect, the measured MT property resembled that of the CMR closely in the field range and frequency ranges studied.

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