The magnetic response at the metal–insulator transition in $La_{1-x}Sr_xTiO_3$ (abstract)

R. Osborn[a)]
Materials Science Division, Argonne National Laboratory, Argonne, Illinois 60439-4845

M. C. Aronson
Department of Physics, University of Michigan, Ann Arbor, Michigan 48109-1120

E. A. Goremychkin
Frank Laboratory of Neutron Physics, JINR, 141980 Dubna, Moscow Region, Russia

J. E. Greedan
Institute for Materials Research, McMaster University, Hamilton, Ontario, Canada L8S 4M1

We report on recent inelastic neutron scattering measurements of the magnetic response close to the metal–insulator transition in $La_{1-x}Sr_xTiO_3$. Specific heat and susceptibility data from Tokura *et al.*[1] give evidence for a divergent effective mass at the critical concentration $x_c = 0.05$ in agreement with recent mean-field theories of the transition. The mass enhancement is believed to arise from the formation of a *d*-electron resonance at the Fermi energy close to the transition. The aim of this investigation is to look for evidence of this resonance in the dynamic magnetic susceptibility. We studied samples with $x = 0$, 0.05, and 0.2 using incident energies between 25 and 200 meV. After correction for the phonon scattering, we observe a broad response above a threshold of 20–30 meV extending to over 100 meV. In addition, the Mott insulating antiferromagnet ($x = 0$) has a peak at 40 meV, consistent with the estimated activation energy derived from resistivity measurements. This feature becomes washed out with temperature and doping. Possible origins for this peak are discussed. [S0021-8979(96)44908-6]

[a)]Supported by US-DOE, BES-MS Contract No. W-31-109-ENG-38.

[1] Y. Tokura, Y. Taguchi, Y. Okada, Y. Fujishima, T. Arima, K. Kumagai, and Y. Iye, Phys. Rev. Lett. **70**, 2126 (1993).

 0021-8979/96/79(8)/6432/1/$10.00