Physica B 432 (2014) 96–99

Contents lists available at ScienceDirect

Physica B

journal homepage: www.elsevier.com/locate/physb

Transport-entropy correlations in $La_{0.7}Ca_{0.3}MnO_3$ manganite

J.C. Debnath *, A.M. Strydom

Department of Physics, University of Johannesburg, PO Box 524, Auckland Park 2006, South Africa

ARTICLE INFO

Article history:
Received 20 August 2013
Received in revised form
19 September 2013
Accepted 21 September 2013
Available online 27 September 2013

Keywords:
Perovskite
Magnetocaloric effect
Resistivity
Magnetic polaron

ABSTRACT

An investigation of the magnetic entropy change ΔS_M and resistivity ρ, and the relation between them, for $La_{0.7}Ca_{0.3}MnO_3$ (LCMO) material has been presented. By using an equation of the form $\Delta S_M = -\alpha \int_0^H \left[\frac{\delta \ln(\rho)}{\delta T}\right]_H dH$ (α=9.98 emu/g), which relates magnetic order to transport behavior of the compounds, we measure the magnetic entropy change ΔS_M from the resistivity measurement, where the resistivity results agree quite well with the fitting parameter α=9.98 emu/g in the intermediate temperature range. This result reveals the predominant role of magnetic polarons on the magnetoresistive property of manganites. It is obvious that magnetic disorder, characterized by ΔS_M, affects the magnetic polarons, while the magnetic polarons influence the electronic transport properties, which may be the underlying reason for a salient $\Delta S_M - \rho$ relation. It also provides an alternative method to determine magnetic entropy change on the basis of resistive measurements.