Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 10.1.1 (E)

Impact of Size Reduction on the Magnetocaloric Effect in Single- and Multi-Phase Manganites[1] N.S. BINGHAM, P. LAMPEN, A. PURI, S. CHANDRA, M.H. PHAN, H. SRIKANTH, University of South Florida, C.L. ZHANG, S.W. CHEONG, Rutgers University, T.H. HOANG, H.D. CHINH, Hanoi University of Technology — Mixed-valent manganites of the form $R_{1-x}M_xMnO_3$ (R=La, Pr, Nd, Sm and M=Sr, Ca, Ba, Pb) are of interest as low-cost materials for potential application in the area of active magnetic refrigeration (AMR). An important parameter to optimize for AMR is the refrigerant capacity (RC), which depends on both the magnitude and breadth of the magnetic entropy change peak. Reducing the dimensions of a system to the nanoscale has the potential to enhance the RC by broadening a transition, but can also lead to a drop in entropy change. In this study, we contrast the impact of size reduction on the magnetic and magnetocaloric properties of single-phase $La_{0.4}Ca_{0.6}MnO_3$ (LCMO) and phase-separated $La_{0.35}Pr_{0.275}Ca_{0.375}MnO_3$ (LPCMO). Nanoparticles of LCMO and LPCMO were prepared by a sol-gel method; single crystals were grown in an optical floating zone furnace. XRD, SEM, and TEM were used to characterize the samples and DC magnetometry measurements were performed using a Quantum Design VSM. We find that size reduction negatively impacts both magnetization and the magnetocaloric properties in LCMO, while enhancing RC and entropy change simultaneously in LPCMO.

[1]Support: DOE-BES Grant No. DEFG02-07ER46438 and FCASST

Nicholas Bingham
binghamn@gmail.com
University of South Florida

[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 15 Dec 2011 Electronic form version 1.4