ABSTRACT

The purpose of this work is to present the findings of an experimental analysis of structural, magnetic, and magnetocaloric properties of the nanocrystalline manganites, $La_{0.8}Sr_{0.15}Na_{0.05}MnO_3$ (LSNMO), with size about 50 nm elaborated via sol-gel route. X-ray diffraction presents that LSNMO crystallize in a rhombohedral structure with the $R\bar{3}c$ space group. Magnetic characterizations demonstrate that LSMNO exhibits a coexistence of interacting superparamagnetic (ISPM) phase with blocking temperature T_B = 194 K and a ferromagnetic phase with Curie temperature T_C = 255.5 K. At low temperatures, the SPM state undergoes a collective freezing state at T_f = 46 K. The maximum magnetic entropy change ($-\Delta S_M^{pk}$) is about 1.41 $Jkg^{-1}K^{-1}$ and the refrigeration capacity (*RC*) is 288 JKg^{-1} for a field change of 5 T at T = 215 K. The magnetocaloric response is reasonably high compared to the bulk materials, and this makes nanoparticles of LSMNO a potential candidate material for active magnetic refrigerators.