New Refrigerant La_{0.7}Ca_{0.15}Sr_{0.15}Mn_{1-x}Ga_xO₃ for Application in Magnetic Refrigeration

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Abstract : We present a new refrigerant La_{0.7}Ca_{0.15}Sr_{0.15}Mn_{1-x}Ga_xO₃ (x = 0.0-0.1) manganites. These compounds were prepared by the sol-gel method. The refinement of the X-ray diffraction reveals that all samples crystallize in a rhombohedral structure (space group R3⁻c). Detailed measurements of the magnetization as a function of temperature and magnetic applied field M (μ_0 H, T) were carried out. From the M(μ_0 H, T) curves, we have calculated the magnetic entropy change (Δ SM) according to the Maxwell relation. The temperature dependence of the magnetization M(T) reveals a decrease of M when increasing the x content. The magnetic entropy change (Δ SM) reaches a maximum value near room temperature. It was also found that this compound exhibits a large magnetocaloric effect MCE which increases when decreasing Ga concentration. So, the studied compounds could be considered potential materials for magnetic refrigeration application.

Keywords : magnetic measurements, Rietveld refinement, magnetic refrigeration, magnetocaloric effect

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