

Structural, magnetic and magnetocaloric properties of Ag-doped $\text{Pr}_{0.5}\text{Sr}_{0.5-x}\text{Ag}_x\text{MnO}_3$ manganites ($0.0 \leq x \leq 0.4$)

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Abstract

The effects of partial silver substitution on the structural, magnetic and magnetocaloric properties of $\text{Pr}_{0.5}\text{Sr}_{0.5-x}\text{Ag}_x\text{MnO}_3$ ($0.0 \leq x \leq 0.4$) compounds have been studied. Our powder specimens are synthesized using the sol-gel method at high temperatures. X-Ray diffraction study reveals that all compounds crystallize in the distorted orthorhombic symmetry with Pbnm space group. Magnetization measurements versus temperature under 0.05 T reveal the presence of an antiferromagnetic (AFM) to ferromagnetic (FM) transition at low temperatures for the parent compound, followed by a second one from FM to paramagnetic state (PM). Ag doping is found to reinforce the FM behavior with a Curie temperature (T_C) increasing from 268 K ($x = 0.0$) to 305 K ($x = 0.2$). However, for higher Ag amount, T_C decreases again from 285 K ($x = 0.3$) to 170 K ($x = 0.4$). The maximum of the magnetic entropy change ($-\Delta S_M^{\max}$) was calculated using the isothermal magnetization curves $M(H)$ under magnetic field change of 5 T and is found to be 4.7 J/(kg K) for $x = 0.3$. The relative cooling power (RCP) turns out to be 188 J/kg and 229 J/kg for $x = 0.0$ and $x = 0.1$, respectively. This suggests that these compounds may be suitable candidates for magnetic refrigeration.

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