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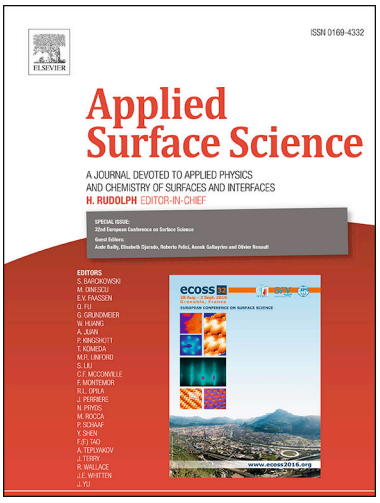

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Surface effects on the magnetocaloric properties of perovskites ferromagnetic thin films: A Monte Carlo study

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Abstract

We have used the Monte Carlo simulations to study the surface effects on the magnetocaloric properties of perovskites ferromagnetic thin films. We have determined the magnetization, the transition temperatures, magnetic entropy change, the relative cooling power (RCP), and the magnetic hysteresis cycle temperature as functions of the film thickness, and surface exchange coupling. The reduced critical temperature t_C of the perovskites ferromagnetic thin films is studied as a function of film thickness L and the exchange interactions in the bulk J_B, in the surface J_S and between surface. We have shown that maximal entropy change in thin film systems can be observed at temperatures well below the magnetic phase transition temperature. The maximal entropy change increases with increasing the external magnetic field. RCP increases with increasing the external magnetic field and it is dependent of thickness film. The RCP decreases with increasing the value of surface exchange coupling. The magnetic coercive field decreases with increasing the temperatures values when the surface exchange coupling is inferior to bulk exchange coupling. The magnetic coercive field h_C of the perovskites ferromagnetic thin films is studied as a function of reduced surface exchange coupling.

Keywords: Monte Carlo simulation; Magnetocaloric effect; Thin film magnetism; Relative cooling power; Reduced surface exchange coupling. Magnetic coercive field.