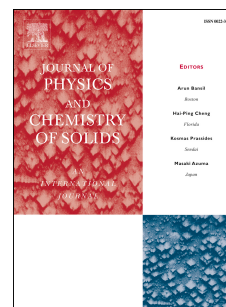


# Accepted Manuscript

Correlation between critical properties and magnetocaloric effect using phenomenological model in  $\text{La}_{0.7}\text{Ca}_{0.2}\text{Ba}_{0.1}\text{MnO}_3$  compound

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# Correlation between critical properties and magnetocaloric effect using phenomenological model in $\text{La}_{0.7}\text{Ca}_{0.2}\text{Ba}_{0.1}\text{MnO}_3$ compound

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## Abstract

This paper presents a theoretical work on magnetic and magnetocaloric properties of  $\text{La}_{0.7}\text{Ca}_{0.2}\text{Ba}_{0.1}\text{MnO}_3$  powder sample elaborated by high energy ball milling. Using the phenomenological model, the magnetocaloric parameters such as the magnetic entropy change  $\Delta S_M$  and the relative cooling power RCP, have been determined from the magnetization data as a function of temperature at several magnetic applied fields. In addition, from the magnetocaloric results, such as  $\Delta S_{max} \approx a (\mu_0 H)^n$  and  $T_{peak} - T_C \approx b (\mu_0 H)^{1/\Delta}$ , the critical exponents values related to the magnetic transition have been determined. The estimated results are close to those expected by the tricritical mean-field model. Furthermore, using other various techniques (such as the modified Arrott plots, the Kouvel-Fisher method and the critical isotherm analysis), the values of the ferromagnetic transition temperature  $T_C$ , as well as the critical exponents  $\beta$ ,  $\gamma$  and  $\delta$  are simulated and compared with those obtained by the theoretical model. A good agreement has been found in the vicinity of the Curie temperature. The field and temperature dependent magnetization follow the scaling theory, and all data fall on two distinct branches, one for  $T < T_C$  and the other for  $T > T_C$ , indicating that the critical exponents obtained in this work are accurate.

**Keywords:** Critical behavior; Magnetic materials, Magnetic phase transition; Magnetocaloric effect; Phenomenological model.

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