

Large magnetocaloric effect in $\text{Pr}_{1-x}\text{Pb}_x\text{MnO}_3$ ($0.1 \leq x \leq 0.5$) perovskites

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Abstract: This research reports the findings of large low-field magnetocaloric effect in polycrystalline $\text{Pr}_{1-x}\text{Pb}_x\text{MnO}_3$ ($0.1 \leq x \leq 0.5$) perovskites. It is found that, upon an applied field of 13.5 kOe, the magnetic entropy change (ΔS_M) reached values of 3.91, 3.68, and 3.34 J/kg K for $x=0.1$, 0.4, and 0.5 compositions, respectively. These values are larger than that of Gd (3.32 J/kg K) and were attained by a low applied magnetic field that can be generated by permanent magnets. These superior magnetocaloric features together with a relatively low material cost make the $\text{Pr}_{1-x}\text{Pb}_x\text{MnO}_3$ perovskites attractive candidate materials for magnetic refrigerators in a temperature range of 150-270 K. © 2006 American Institute of Physics.

Index Keywords: Composition; Magnetic field effects; Permanent magnets; Polycrystalline materials; Praseodymium compounds; Magnetic entropy; Magnetic refrigerators; Magnetocaloric effects; Perovskite

Year: 2006

Source title: Journal of Applied Physics

Volume: 99

Issue: 8

Art. No.: 08Q108

Link: [Scopus Link](#)

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ISSN: 218979

CODEN: JAPIA

DOI: 10.1063/1.2172212

Language of Original Document: English

Abbreviated Source Title: Journal of Applied Physics

Document Type: Article

Source: Scopus

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References:

- Pecharsky, V.K., Gschneidner Jr., K.A., (1999) *J. Magn. Magn. Mater.*, 200, p. 44
- Gschneidner Jr., K.A., Takeya, H., Moorman, J.O., Pecharsky, V.K., Malik, S.K., Zimm, C.B., (1994) *Adv. Cryog. Eng.*, 39, p. 1457
- Korte, B.J., Pecharsky, V.K., Gschneidner Jr., K.A., (1998) *Adv. Cryog. Eng.*, 43, p. 1737
- Duc, N.H., Kim Anh, D.T., Brommer, P.E., (2002) *Physica B*, 319, p. 1
- Bohigas, X., Tejada, J., Del Barco, E., Zhang, X.X., Sales, M., (1998) *Appl. Phys. Lett.*, 73, p. 390
- Guo, Z.B., Du, Y.W., Zhu, J.S., Huang, H., Ding, W.P., Feng, D., (1997) *Appl. Phys. Lett.*, 78, p. 1142
- Wada, H., Morikawa, T., Taniguchi, K., Shibata, T., Yamada, Y., Akishige, Y., (2003) *Physica B*, 328, p. 114
- Tegus, O., Bruck, E., Zhang, L., Dagula, Buschow, K.H.J., De Boer, F.R., (2002) *Physica B*, 319, p. 174
- Phan, M.H., Srinivas, V., Yu, S.C., Hur, N.H., (2003) *J. Appl. Phys.*, 93, p. 8200
- Phan, M.H., Phan, T.L., Yu, S.C., Tho, N.D., Chau, N., (2004) *Phys. Status Solidi B*, 241, p. 1744
- Phan, M.H., Yu, S.C., Hur, N.H., Jeong, Y.H., (2004) *J. Appl. Phys.*, 96, p. 1154
- Tomioka, Y., Asamitsu, A., Kuwahara, H., Moritomo, Y., Tokura, Y., (1996) *Phys. Rev. B*, 53, p. 1689