Accepted Manuscript

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PII: S0925-8388(16)33029-8

DOI: 10.1016/j.jallcom.2016.09.266

Reference: JALCOM 39100

To appear in: *Journal of Alloys and Compounds*

Received Date: 7 March 2016

Revised Date: 16 May 2016

Accepted Date: 24 September 2016

Please cite this article as: Z.-J. Mo, Z.-H. Hao, J.-Z. Deng, J. Shen, L. Li, J.-F. Wu, F.-X. Hu, J.-R. Sun, B.-G. Shen, Observation of giant magnetocaloric effect under low magnetic field in $Eu_{1-x}Ba_xTiO_3$, *Journal of Alloys and Compounds* (2016), doi: 10.1016/j.jallcom.2016.09.266.

Observation of giant magnetocaloric effect under low magnetic field in $Eu_{1-x}Ba_xTiO_3$

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Abstract: The magnetic properties and magnetocaloric effect in $Eu_{1-x}Ba_xTiO_3$ (x = 0, 0.04, 0.08, 0.1) compounds are investigated. With slight Ba-doping, the antiferromagnetic ordering of pure $EuTiO_3$ can be significantly changed to ferromagnetic due to the size Ba^{2+} ion bigger than Eu^{2+}. A giant reversible magnetocaloric effect and large RC in $Eu_{1-x}Ba_xTiO_3$ compounds were observed. The maximum value of magnetic entropy change ($-\Delta S_M^{max}$) reaches to 41.4 J/kg K for $Eu_{0.92}Ba_{0.08}TiO_3$ under the magnetic field change of 5 T. Especially, under the magnetic field changes of 1 and 2 T, the values of $-\Delta S_M^{max}$ are evaluated to be 12.5 and 23.4 J/kg K and the maximum values of RC are 54 and 119 J/kg, without magnetic and thermal hysteresis for $Eu_{0.92}Ba_{0.08}TiO_3$. Therefore, the giant reversible magnetocaloric effect and large RC make the $Eu_{1-x}Ba_xTiO_3$ compounds could be considered as a good candidate material for low-temperature and low-field magnetic refrigerant.

Keywords: magnetocaloric effect; magnetic entropy change; refrigerant capacity; $Eu_{1-x}Ba_xTiO_3$

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