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Observation of giant magnetocaloric effect under low magnetic field in



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Abstract: The magnetic properties and magnetocaloric effect in $\text{Eu}_{1-x}\text{Ba}_x\text{TiO}_3$ ($x = 0, 0.04, 0.08, 0.1$) 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 $\text{Eu}_{1-x}\text{Ba}_x\text{TiO}_3$ compounds were observed. The maximum value of magnetic entropy change ($-\Delta S_M^{\max}$) reaches to 41.4 J/kg K for $\text{Eu}_{0.92}\text{Ba}_{0.08}\text{TiO}_3$ 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 $\text{Eu}_{0.92}\text{Ba}_{0.08}\text{TiO}_3$. Therefore, the giant reversible magnetocaloric effect and large RC make the $\text{Eu}_{1-x}\text{Ba}_x\text{TiO}_3$ 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; $\text{Eu}_{1-x}\text{Ba}_x\text{TiO}_3$

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