Terbium aluminum borate as promising material for magnetic refrigeration

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Rotational magnetocaloric effect in $TbAl_3(BO_3)_4$ single crystal was studied by using measurements of the field dependences of magnetization and the temperature dependence of heat capacity. This effect has been modeled within the quasidublet approximation. The changes of isothermal entropy caused by rotation of the crystal in constant magnetic field from an easy axis to a hard axis of magnetization were estimated. The maximum value of entropy changes was about 12.12 J/(mol·K) at temperature 5 K and magnetic field 5T. The field dependence of refrigerant capacity (RC) was calculated and the value of RC was 221 J/kg at magnetic field 5T. The rotational magnetocaloric effect was determined for various magnetic fields at different temperatures. The maximum effect value was about 12 K in magnetic field $\approx$ 2 T at initial temperature of the crystal 13.2 K. It was shown that the terbium aluminum borate can be the perspective material for magnetic cooling at low temperatures.