The effect of demagnetization on the magnetocaloric properties of gadolinium

Gadolinium displays a strong magnetocaloric effect at temperatures close to room temperature making it useful in the field of room temperature magnetic refrigeration. We discuss the importance of including the effects of the demagnetization field when considering the magnetocaloric properties of gadolinium. The adiabatic temperature change $\Delta T_{ad}$ of gadolinium sheets upon application of a magnetic field has been measured at a range of applied magnetic fields and sample orientations. A significant dependence of $\Delta T_{ad}$ on the sample orientation is observed. This can be accounted for by the demagnetization factor. Also, the temperature dependence of $\Delta T_{ad}$ has been measured experimentally and modeled by mean field theory. Corrections to mean field theory modeling due to the demagnetization field are proposed and discussed. ©2009 American Institute of Physics

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Contributors: Bahl, C. R. H., Nielsen, K. K.
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