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Magnetocaloric Effect in Gd/W multilayers[1] D. WILLIAMS, C. BAUER, N. BINGHAM, H. SRIKANTH, CASEY W. MILLER, Physics Dept., University of South Florida, Tampa, FL — The magnetocaloric effect (MCE) has the potential to lead to advances in magnetic refrigeration. While much is known about the MCE in bulk materials, comparatively little is known about the MCE in thin film nanostructures. To that end, MgO/[W(50Å)/Gd(400Å)]_8/W(50Å) heterostructures have been grown to study how nanostructuring effects MCE. The entropy change associated with the second order magnetic phase transition was determined from the isothermal magnetization at temperatures. The entropy peak is approximately 2 J/kG-K for a 0-3T field change, and occurs at a temperature of ∼280K. The full width at half max of the entropy change peak is about 90K, which is roughly twice that of bulk Gd. Interestingly, the relative cooling power of this nanoscale system is 1.1 J/cm^3, which is similar to the 1.4 J/cm^3 of bulk Gd. Further analyses of phase transition using the Arrott-Noakes method suggests finite size effects may affect the critical exponents, offering a method by which to tune the MCE.

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