Anisotropic Magnetocaloric Effect in Single Crystalline NiTa$_2$O$_6$\textsuperscript{1}

AARON T. SCHYE, SUELI H. MASUNAGA, AARON B. CHRISTIAN, JOHN J. NEUMEIER, Montana State University, YI-KUO YU, National Center for Biotechnology Information — Magnetic susceptibility and heat capacity measurements were made on the low-dimensional antiferromagnet NiTa$_2$O$_6$. The antiferromagnetic structure most consistent with our measurements is the two sub-lattice model proposed by Law et al.\textsuperscript{2} in which magnetic moments in the $z = 0$ plane are aligned parallel to [110] and those in the $z = 1/2$ plane are aligned parallel to [1 $\bar{1}$0]. Applying a magnetic field along [110] causes the peak in the heat capacity to split into two with one remaining at $T_N$ and the other shifting to lower temperatures as the field is increased with a maximum $\Delta T \sim 3$ K at 8 T. This splitting indicates that each sub-lattice orders at different Néel temperatures. Calculation of the magnetic entropy change associated with an increase in magnetic field($\Delta S_m(T, \Delta H)$) reveals $\Delta S_m(T, \Delta H) \sim 0.7$ J/kg K for $H \parallel [110]$ and $\Delta S_m(T, \Delta H) \sim 0$ J/kg K for $H \parallel [001]$ if $\Delta H = 8$ T. This anisotropy in the magnetocaloric effect suggests that rotating the sample in constant magnetic field will result in a change in sample temperature.

\textsuperscript{1}Supported by NSF Grant DMR-0907036