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Investigation of Elastic and Magnetic Properties in $Sm_2Ti_2O_7$
Y. W. MAGANDA, G. QUIRION, Memorial University, D. ZIAT, Universite de sherbrooke, P. SANTRE, C. A. WIEBE, University of Winnipeg, A. AKBAR-SHARBAF, Universite de sherbrooke, Z. L. DUN, H. D. ZHOU, University of Tennessee, J. A. QUILLIAM, Universite de sherbrooke — Magnetically frustrated pyrochlore oxides continue to attract a great deal of attention due to the possibility of observing exotic low temperature magnetic states. Among these, $Sm_2Ti_2O_7$ is a singular example as the magnetic Sm^{3+} ions exhibit a very small moment ($\mu = 0.15\mu_B$) weakly coupled via exchange interaction ($\theta_{cw} = -0.26K$). Recent magnetization observations suggest that spin correlations begin to develop below 2K, although no long range order is observed down to 0.5 K. Therefore, we have investigated the elastic and magnetic properties of a $Sm_2Ti_2O_7$ single crystal using specific heat and ultrasonic measurements down to 50 mK. The specific heat results clearly reveal a cusp at approximately 350 mK, suggesting the existence of a second order phase transition. From the ultrasonic measurements, at zero magnetic field, the principal elastic constants all show an anomaly at 350 mK, consistent with a magnetic phase transition. For a magnetic field applied along the [100] direction, the critical temperature is suppressed and a critical field is at 6 T. For a field along the [111] direction, the transition is broadened and no critical field is observed up to 12 T. Thermal and field hysteresis are observed in the variation of the elastic constants indicating a slow relaxation of the spins toward thermal equilibrium.

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