Macroscopic and microscopic properties in magnetically frustrated $Tb_2M_2O_7$ (M = Ti, Sn)

Y. Chapuis[1], P. Dalmas de Réotier[1], A. Yaouanc[1],C. Marin[1]
S. Vanishri[1], A. Forget[2], C. Vaju[1], V. Glazkov[1]
S. Sosin[1], L.-P. Regnault[1], B. Fåk[1], C. Baines[2], A. Amato[3]
[1]CEA/DSM/Inac/SPSMS, Grenoble, France
[2]CEA/DSM/Inac/SPSMS, Grenoble, France
[3]PSI, Villigen, Switzerland

September 17, 2009

Abstract

$Tb_2Ti_2O_7$ (TTO) and $Tb_2Sn_2O_7$ (TSO) are two geometrically frustrated magnets which crystallize in the pyrochlore structure, made of corner sharing regular tetrahedra. While, at first sight, their properties should be very similar, their ground states are actually quite different. TSO undergoes a magnetic transition towards a so-called ordered spin ice structure below 0.88 K. TTO remains paramagnetic down to 20 mK, which makes it a good candidate for a spin liquid. We present an investigation of crystals of TTO and a powder of TSO by macroscopic and microscopic methods. The specific heat of TTO depends strongly on the growth conditions, but the associated entropy variation up to 20 K is unaffected by them and inconsistent with a Tb^{3+} ground state doublet. Our inelastic neutron scattering data are compatible with published ones, but our low temperature muon spin relaxation data are not. The entropy variation of TSO is not consistent with a Tb^{3+} ground state doublet as well.