Abstract Submitted
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$Dy_2Ti_2O_7$ Spin Ice Thin-Films[1] LAURA BOVO, London Centre for Nanotechnology and Department of Physics and Astronomy, UCL, XAVIER MOYA, Cambridge, DHARMALINGAM PRABHAKARAN, Oxford, YEONG-AH SOH, UCL, ANDREW T. BOOTHROYD, Oxford, NEIL D. MATHUR, Cambridge, GABRIEL AEPPLI, STEVE T. BRAMWELL, UCL — Spin ice[1] illustrates much novel science, including unusual phases, degeneracies, quasiparticles and topology[1-4]. A characteristic feature of spin ice is its apparent violation of the Third Law of thermodynamics. This leads to a number of interesting properties including the emergence of an effective vacuum for 'magnetic monopoles' and their currents - 'magnetricity'. Here we add a new dimension to the experimental study of spin ice by fabricating thin epitaxial films of $Dy_2Ti_2O_7$ on an inert substrate. The films show the distinctive characteristics of spin ice at temperatures greater than 2 K, but at lower temperature we find evidence of a zero entropy state. This restoration of the third law in spin ice thin films is consistent with a predicted [5] strain-induced ordering. Our results illustrates how the fabrication and study of thin films opens up new possibilities for the control and manipulation of the unusual magnetic properties of spin ice materials and related frustrated magnets.

[1] Harris M.J. et al. PRL 79, 2554(1997) [2] Ramirez A.P. et al. Nature 399, 333(1999) [3] Ryzhkin I.A. J. Exp. and Theor. Phys. 101, 481(2005) [4] Castelnovo C. et al. Nature 451, 42(2008) [5] Jaubert L.D.C. PRL 105, 087201(2010)

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