Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 10.2 (E)

Tricriticality and giant magneto-elasticity in CoMnSi[1]

KARL SANDEMAN, ZSOLT GERCSI, Imperial College London, ALEX BARCZA, University of Cambridge, KEVIN KNIGHT, ISIS, Rutherford Appleton Laboratory — Tricritical magnets have previously facilitated the study of different critical phenomena and scaling laws by varying external parameters (pressure, field and temperature) instead of composition. We have studied tricritical magnets driven by interest in the enhanced magnetocaloric effects seen at the first order side of a tricritical point where hysteresis can be minimised. Here we describe the results of microcalorimetry, Hall probe imaging, dilatometry, magnetometry and neutron diffraction experiments and density functional calculations. We build a picture of the relation between structure and magnetism in CoMnSi and find a giant magneto-elasticity that underpins the evolution of first order behavior in this metamagnetic helical antiferromagnet [2]. We are then able to use density functional theory to predict new metamagnets based on this insight. These have been successfully synthesized [3].

[1] K.G. Sandeman, Magnetics Technology International **1** 32 (2011).
[2] A. Barcza et al., Phys. Rev. Lett. **104** 247202 (2010).
[3] Z. Gercsi, K. Hono and K.G. Sandeman, Phys. Rev. B **83** 174403 (2011) and references therein.

[1]The research leading to these results has received funding from the European Community's 7th Framework Programme under grant agreement 214864. K.G.S. gratefully acknowledges financial support from the Royal Society.

[X] Prefer Oral Session
[ ] Prefer Poster Session

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Date submitted: 08 Dec 2011 Electronic form version 1.4