Contribution ID : **81** Type : **Poster**

Magnetic Structure and Magnetocaloric Properties of LaMn2Ge2

Thursday, 12 November 2020 17:58 (1)

The extensive set of ternary intermetallic RMn2X2 compounds (R = rare earth, T = transitional metal, X = Ge or Si) have been investigated extensively in the past few decades due to their interesting range of physical properties [e.g. 1-3]. Recently, significant attention has been paid to the magnetocaloric effect (MCE) of RMn2X2 compounds for their potential application in magnetic refrigeration. Their MCE properties are important as RMn2X2 compounds enable a wide range of structural and magnetic behaviours and related transitions to be controlled via substitution of R, Mn, and X atoms on the 2a, 4d, and 4e sites respectively [e.g. 4-7].
We have carried out a detailed investigation of the LaMn2Ge2 compound using neutron diffraction and magnetic measurements, focusing on the magnetic behaviour of the Mn-sublattice. With decreasing temperature, the magnetic state changes from paramagnetism to incommensurate canted antiferromagnetism AFfs at TN ~ 360 K and then gives way to incommensurate canted ferromagnetism Fmi below TC ~ 323 K. No obvious magnetoelastic coupling were detected from refinement of the variable neutron diffraction patterns (5 K - 450 K) while detailed analyses of magnetic data indicate that the magnetic phase transition is second order. Under magnetic field changes of 2 T and 8 T, the maximum values of the magnetic entropy change (-DELTASM max) around TC reach 1.65 J/kg K and 4.42 J/kg K, respectively.

References
1. Dincer I, Elmali A, Elerman Y, Ehrenberg H, Fuess H, Isnard O. Neutron diffraction study of the magnetic structures of PrMn2-xCoxGe2 (x=0.4, 0.5 and 0.8) with a new refinement procedure. J Phys-Condes Matter. 2004;16(12):2081-91.
2. Gerasimov EG, Kanomata T, Gaviko VS. Interrelation between electronic structure and interatomic distances for RMn2X2 compounds. Physica B-Condensed Matter. 2007;390(1-2):118-23.
3. Wang JL, Kennedy SJ, Campbell SJ, Hofmann M, Dou SX. Phase gap in pseudoternary R1-yRy ' Mn2X2-xXx ' compounds. Phys Rev B. 2013;87(10):5.
4. Li LW, Nishimura K, Hutchison WD, Qian ZH, Huo DX, NamiKi T. Giant reversible magnetocaloric effect in ErMn2Si2 compound with a second order magnetic phase transition. Appl Phys Lett. 2012;100(15):4.
5. Din MFM, Wang JL, Campbell SJ, Zeng R, Hutchison WD, Avdeev M, et al. Magnetic properties and magnetocaloric effect of NdMn2-xTixSi2 compounds. Journal of Physics D-Applied Physics. 2013;46(44):11.
6. Kennedy S, Wang JL, Campbell S, Hofmann M, Dou SX. Pressure induced magneto-structural phase transitions in layered RMn2X2 compounds (invited). Journal of Applied Physics. 2014;115(17):6
7. Li GX, Wang JL, Cheng ZX, Ren QY, Fang CS, Dou SX. Large entropy change accompanying two successive magnetic phase transitions in TbMn2Si2 for magnetic refrigeration. Appl Phys Lett. 2015;106(18):5

Speakers Gender

Male

Level of Expertise

Expert

Do you wish to take part in the poster slam

No

Primary author(s) : Prof. 1, 2, 3 WANG, J L (University of Wollongong); Prof. 1 CHENG, Z X (University of Wollongong); Dr 3 WANG, W Q (Jilin University); Dr 4 WANG, C W (ANSTO); Dr 2 HUTCHISON, W D (UNSW Canberra); Prof. 2 CAMPBELL , S J (UNSW Canberra)

Presenter(s) : Prof. 2 CAMPBELL , S J (UNSW Canberra)

Session Classification : Poster Session

Track Classification : Magnetism & Condensed Matter