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Magnetic Structure and Magnetocaloric Properties of LaMn2Ge2

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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.

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Level of Expertise

Expert

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No

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