Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Strain induced ferromagnetism and magnetocaloric effect in LaFe2Si2 thin film GUIXIN CAO, GERMAN SAMOLYUK, SIWEI TANG, LIANG QIAO, WENBIN WANG, JIEYU YI, THOMAS ZAC WARD, MICHAEL BIEGALSKI, WOLTER SIEMONS, DAVID MANDRUS, MALCOLM STOCKS, ZHENG GAI, Oak Ridge National Laboratory — Great interest in magnetic refrigeration techniques based on the magnetocaloric effect (MCE) has grown recently due to its high efficiency and environmental friendliness. Although the thin film form of the materials is very important in both application and fundamental research, as the properties of films can be tailored by parameters like epitaxial strain, studies on MCE in single crystal films are limited by the difficulty of the growth. In this work, LaFe2Si2 thin films are successfully tuned from Pauli paramagnetic to ferromagnetic, and MCEs are observed around 50K. The ferromagnetic transition is a first order transition, and the magnetic entropy ΔS $\approx$-8.5 J/Kg K is obtained under a magnetic field of 7T. The magnetocaloric effect is characterized by a 14 K hysteresis in the field cooling and field warming process. Our temperature dependent X-ray measurements exclude the correlation between the striking MCE of the thin film and structural transition. Density functional theory (DFT) calculations indicate that the strain induced distance variations of Si-Fe bonds control the magnitude of the magnetic moment and MCE.

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Date submitted: 09 Nov 2012 Electronic form version 1.4