Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Novel rare-earth free magnetic nanostructures[1] BHASKAR DAS, BALAMURUGAN BALASUBRAMANIAN, PINAKI MUKHERJEE, PRIYANKA MANCHANDA, RALPH SKOMSKI, University of Nebraska, Lincoln, NE 68588, GEORGE HADJIPANAYIS, University of Delaware, Newark, DE 19716, DAVID SELLMYER, University of Nebraska, Lincoln, NE 68588 — Magnetic nanostructuring including stabilization of novel structures without critical elements, easy-axis alignment, and self-assembly are important for creating new magnetic materials. We use a single-step process in a cluster-deposition system to fabricate rare-earth-free nanostructured magnetic materials with potential for high-energy magnet or spintronics applications.[2] For example, Mn_5Si_3 nanoclusters of diameter about 8 nm form hexagonal $D8_8$ structure and show strong ferromagnetic properties with a high $T_c = 590$ K, an appreciable $K_1 = 11$ Mergs/cm^3, and a high J_s =12.5 kG. This result is in a sharp contrast to the antiferromagnetic ordering observed in bulk Mn_5Si_3 with $T_N = 100$ K, and is supported by DFT calculations. On the other hand, MnSi nanoclusters form B20-type cubic crystal structure and are ferromagnetic below T = 25 K. Skyrmion-type spin structures have been observed in MnSi thin films and evidence for such structures in nanoclusters will be discussed.

[1]This research is supported by U.S. DOE-BES-DMSE(DE-FG02-04ER46152) and NCMN.

[2]B. Balamurugan, B. Das, D. J Sellmyer et al., *Advanced Materials*, **25**, 6090 (2013).

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Date submitted: 14 Nov 2014 Electronic form version 1.4