Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Size Effects in Nanostructured MnBi[1] LAURA H. LEWIS, KYONGHA KANG, ARNOLD MOODENBA, Brookhaven National Laboratory — In addition to variations in temperature, pressure and magnetic field, nanostructuring can tailor the magnetostructural transition; in particular, transition temperatures and anisotropies may change as the material expresses large surface:volume ratios. Compositions near the Mn-Bi eutectic (Mn5Bi95, Mn10Bi90) were rapidly solidified to produce the ferromagnetic low-temperature phase (LTP) NiAs-type MnBi embedded in a Bi matrix. High-resolution TEM reveals that the two compositions have different microstructures: the Mn5Bi95 composition consists of isolated nanorods (10 nm x 30 nm) self-assembled along the major hexagonal symmetry directions of the Bi matrix. In contrast, the Mn10Bi90 composition exhibits regions of equiaxed clustered MnBi precipitates (50 100 nm) in addition to regions of isolated nanorods. SQUID magnetometry shows that the Mn5Bi95 composition has an abrupt magnetization decrease for T $>$ 520 K associated with a first- order hysteretic magnetostructural transformation from LTP MnBi to high-temperature phase (HTP) MnBi. This transition temperature is 100 degrees lower than that of the Mn5Bi95 composition, which exhibits the bulk MnBi transition temperature of 633 K with second-order character.

[1]Research performed under the auspices of the U.S. Dept. of Energy, Division of Materials Sciences, Office of Basic Energy Sciences under contract No. DE-AC02-98CH1-886.

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Date submitted: 19 Dec 2005 Electronic form version 1.4