Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Fingerprinting Morphology of Magnetic Shape Memory Alloys Using First Order Reversal Curves (FORC) and Neutron Scattering.[1]
IGOR V. ROSHCHIN, Texas A&M Univ., PAVEL N. LAPA, Texas A&M Univ., Argonne Nat. Lab., KATHRYN L. KRYCKA, BRIAN B. MARANVILLE, CNR, NIST, JAMES A. MONROE, BRIAN E. FRANCO, IBRAHIM KARAMAN, Texas A&M Univ. — In Ni-Mn-In- and Ni-Mn-Sn-based alloys, two magnetic phases with ferromagnetic and antiferromagnetic exchange couplings between two nearest Mn atoms can coexist. The interaction between these phases results in exchange bias (EB). The EB field depends on the cluster sizes. Using the first order reversal curve (FORC) analysis of magnetization for Ni-Co-Mn-Sn and Ni-Co-Mn-In samples with different heat treatment, we can obtain information about cluster sizes of the structural phases in these alloys. This is especially important for polycrystalline alloy samples where dark-field images showing different phases are hard to obtain. Such a Ni-Co-Mn-Sn polycrystalline sample was characterized with small angle neutron scattering (SANS). Analyses of the scattering as a function of wavevector transfer in 50 Oe and 15 kOe applied field yield the average magnetic domain size of 21.2±6.6 nm and a polydispersity of 0.32±0.02 at 300 K, in good agreement with our prediction. The temperature evolution of the domain size will be discussed. Using an off-specular reflectometer in transmission geometry, the same sample was measured at a field of 270 Oe and 5.15 kOe. The fit of the 270 Oe data yields grain sizes of approximately 0.11–0.12 μm with polydispersities between 0.98 and 1.27.

[1]Supported by Texas A&M University, US-DOE, and US NSF-DMR.

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Date submitted: 06 Nov 2015 Electronic form version 1.4