Abstract Submitted
for the TSF13 Meeting of
The American Physical Society

Effect of morphology on exchange bias in NiCoMnSn and NiCoMnIn magnetic shape memory alloys PAVEL LAPA, JAMES A. MONROE, BRIAN E. FRANCO, IBRAHIM KARAMAN, IGOR V. ROSHCHIN, Texas A&M University — Exchange bias (EB) which manifests itself as a shift of hysteresis loop is one of puzzling magnetic properties of magnetic shape memory (MSM) alloys. Despite a few attempts to explain the mechanism, there is no comprehensive model describing it. The main obstacle is a lack of information about the magnetic structures in martensitic and austenite phases. In contrast to classical EB systems where the exchange coupling happens at the interface between ferromagnetic and antiferromagnetic layers, the EB coupling in MSM alloys occurs due to coexistence of ferromagnetic and antiferromagnetic regions in bulk martensitic state. The purpose of our work is to obtain the information about the size distribution of ferromagnetic and antiferromagnetic regions. We observe a correlation of EB with the secondary heat treatment for NiCoMnIn alloys. Comparative first order reversal curve (FORC) analysis for NiCoMnSn samples with different heat treatments suggests a correlation between morphology and distribution of exchange bias values. To enhance the difference in morphology, we developed a fabrication procedure for a set of NiMnSn samples with varied alloy composition. We report the results of structural analysis obtained using wavelength-dispersive X-ray spectroscopy (WDS) and magnetic characterization of these samples. Work is funded by TAMU and US NSF-DMR MMN program/MWN initiative grant 1108396.

Pavel Lapa
Texas A&M University

Date submitted: 06 Sep 2013 Electronic form version 1.4