Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Effect of annealing on the surface magnetic and magnetoimpedance properties of Co-based amorphous microwires V. KALAPPATTIL, J. DEVKOTA, E. CLEMENTS, S. CHANDRA, Department of Physics, University of South Florida, J.S. LIU, H.X. SHEN, J.F. SUN, Institute of Materials Science and Engineering, Harbin Institute of Technology, H. SRIKANTH, M.H. PHAN, Department of Physics, University of South Florida — Magnetic domains of negative magnetostrictive amorphous microwires (AWs) form a core-shell type structure with the core and shell domains preferred along axis and circumference, respectively. In this work, we have studied the effect of a combined current modulation annealing on the bulk and surface magnetic properties of melt-extracted $Co_{68.2}Fe_{4.3}B_{15}Si_{12.5}$ and $Co_{68.2}Fe_{4.3}B_{14}Si_{12.5}Nb_1$ AWs and their correlations with the magnetoimpedance (MI) effect. The AWs were annealed by a combination of ac (90 mA, 50 Hz) and dc (60, 63, and 65 mA) currents for 480 seconds each, and magnetic hysteresis loops were measured by VSM and a magneto-optic Kerr effect (MOKE) magnetometer. Compared to VSM loops, MOKE loops for the annealed AWs were observed to have higher coercive and anisotropy fields, indicating that the near-surface region was magnetically harder. The anisotropy fields of the AWs defined as the peaks of the MI spectra at 1 MHz and 500 MHz were found to have a correlation with those probed by VSM and MOKE, respectively. These findings are of practical importance in designing MI-based sensors.

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Date submitted: 12 Nov 2014 Electronic form version 1.4