Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Phase separation and giant exchange bias in Mn-based binary alloys[1] F. JIMENEZ-VILLACORTA, J.L. MARION, L.H. LEWIS, Department of Chemical Engineering, Northeastern University
— The ability to tailor, control and modify the magnetic properties of Mn-based alloys opens the possibility of developing exchange bias systems for permanent magnet and sensor technologies. Rapid solidification of AgMn, CuMn and AlMn manganese-based alloys, with significant Mn concentration ($\sim$ 30-70 at%), has produced alloys that all exhibit a remarkable exchange bias at T = 10 K, of the order of $\sim$ 10 kOe. Structural characterization confirms the formation of a phase-separated nanostructure (*fcc* for AgMn and CuMn and *hcp* for AlMn) of 40-80 nm in all alloys as characterized by phase-specific crystallographic texture and lattice parameters. The observed exchange bias is highly reduced upon moderate annealing (T = 250 °C) accompanied by homogenization of the Mn concentrations in the alloys. These results are tentatively attributed to different metastable incorporation of Mn within the two phases, yielding slightly different unit cell volumes, which provides an antiferromagnetic (Mn-rich phase) and ferromagnetic (Mn-poor phase) character in these two phases.

[1]This research has been funded by the Office of Naval Research (ONR) under Grant # N00014-10-1-0553.

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Date submitted: 19 Nov 2011 Electronic form version 1.4