Phase separation and giant exchange bias in Mn-based binary alloys\textsuperscript{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 ($T = 250 ^\circ C$) 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.

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