

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Combinatorial Approach for High-efficiency Magnetization Measurements of Co-Fe-Ni Alloys with a Scanning Hall Probe Microscope
GIRFAN SHAMSUTDINOV, DEBABRATA MISHRA, BORIS NADGORNYY, Wayne State University, PENG ZHAO, JI-CHENG ZHAO, Ohio State University, SREENIVAS BHATTIPROLU, Oxford Instruments America Inc. — A Scanning Hall Probe Microscope with a submicron scale Hall probe (HP) was used for high efficiency measurements of magnetic properties of Co-Fe diffusion couples. Co-Fe couples were made by placing Co and Fe blocks in an intimate contact and annealing at high temperature to allow thermal interdiffusion to create solid-solution with a composition varying gradually from pure Fe to pure Co. The magnetic field in the vicinity of these variable composition Fe-Co alloys, with the width of approximately 400 microns, was measured continuously as the HP was scanned across the interdiffusion region. Using a simple model, we determined the composition dependent saturation magnetizations of Co-Fe alloys. The values of the saturation magnetization were in good agreement with the known values for pure Fe and Co. The composition variation and the crystal structure along the scan line were measured independently using Energy Dispersive X-ray Spectroscopy (EDS) and Electron Backscatter Diffraction (EBSD). Similar measurements were performed for the Fe-Ni and Co-Ni interfaces. This study demonstrates that Scanning Hall microscopy can be used for high efficiency and high accuracy measurements of saturation magnetization in variable composition alloys.

Girfan Shamsutdinov
Wayne State University

Date submitted: 10 Nov 2012

Electronic form version 1.4