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High-Throughput Magnetization Measurements of Co-Fe-Ni variable composition alloys with a Scanning Hall Probe Microscope GIRFAN SHAMSUTDINOV, BORIS NADGORNY, Wayne State University, PENG ZHAO, JI-CHENG ZHAO, Ohio State, SREENIVAS BHATTIPROLU, Oxford Instruments — A Scanning Hall Probe Microscope (SHPM) with a submicron Hall probe (HP) was used for high efficiency characterization of Co-Fe-Ni binary and ternary alloys. The Co-Fe-Ni alloys were fabricated by annealing three metal blocks placed in intimate contact at high temperatures to allow thermal interdiffusion to create solid-solution with a composition spread over the binary and the ternary diffusion regions. The change in the magnetic field in the vicinity of these couples and multiples, Fe-Co, Fe-Ni, Co-Ni and Co-Fe-Ni alloys, was measured continuously as the HP was scanned across the interdiffusion regions. Using a simple model we have then determined the corresponding values of saturation magnetizations of the alloys that came out to be in good agreement with the known values for pure Fe, Co and Ni. The composition variations and crystal phase structure over the scan regions were measured independently using Energy Dispersive X-ray Spectroscopy (EDS) and Electron Backscatter Diffraction (EBSD). Using this technique, the composition-structure-property relationship for the Co-Fe-Ni diffusion system was determined for the first time. This study demonstrates that Scanning Hall microscopy, in combination with microanalyses techniques, can be effectively applied for high efficiency and high accuracy investigations of composition-structure-property relationship and to accelerated materials design.

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