

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

SEMPA Measurements of Ferromagnetic Nanodisk Phase Diagrams SEOK-HWAN CHUNG, CNST, NIST / Maryland NanoCenter, U. of Maryland, ROBERT MCMICHAEL, DANIEL PIERCE, JOHN UNGURIS, CNST, NIST — We use Scanning Electron Microscopy with Polarization Analysis (SEMPA) to image the magnetic domain structures of ferromagnetic nanodisks with different diameters and thicknesses, and thereby determine the phase diagram of the ground state in these technologically important magnetic structures. Depending on the nanodisk dimensions, one of three distinct ground state magnetic configurations is observed: a single domain in-plane, a single domain out-of-plane, or a vortex state. In contrast to previous work, the magnetic states of *individual* nanodisks are determined using simultaneous SEMPA measurements of both the in-plane and out-of-plane magnetization components. By systematically imaging Permalloy nanodisks with diameters that range from 35 nm to 190 nm and with thicknesses that range from 10 nm to 65 nm, we are able to locate phase boundaries and the triple point between the three phases. Near the phase boundaries and triple point we observe a mixture of the different phases. A model magnetic phase diagram generated by using the OOMMF micromagnetic simulator is found to agree well with the phase diagram determined by the SEMPA measurements. This work is supported by the NIST-CNST/UMD-NanoCenter Cooperative Agreement.

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Date submitted: 24 Nov 2008

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