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Magnetization manipulation in ferromagnetic nanoscale disks[1]
WENMING JU, UMass Amherst, MADELINE SHORTT, MINA KHAN, JESSICA BICKEL, KATHY AIDALA, Mount Holyoke College, MARK TUOMINEN, UMass Amherst — A ferromagnetic nanodisk, several hundred nanometers in radius and several tens of nanometers in thickness, has in-plane curling magnetization distribution around the center and out-of-plane magnetization vortex core at the center. Here, permalloy disks were patterned by electron-beam lithography. We investigated the in-plane curling magnetization direction (i.e., clockwise or counter-clockwise) by applying a uniform external magnetic field and observing the motion of vortex core via Magnetic Force Microscopy (MFM). We conducted experiments to reverse the in-plane curling direction for the magnetization by applying a circular magnetic field around the disk center with a conducting AFM tip [1]. Micro-magnetic simulations were performed to give a comparison and better understanding of the experimental work.

[1] T. Yang, et al. "Manipulation of magnetization states of ferromagnetic nanorings by an applied azimuthal Oersted field," Applied Physics Letters 98, 242505 (2011).

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