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Micromagnetic simulations of the transition between vortex and single-domain magnetization states in sub-100 nm nanodots[1] ANDREW T. KING, IGOR V. ROSHCHIN, Texas A&M University — The magnetic vortex state in nanodots has demonstrated unique properties, which may improve magnetic data storage technologies. To utilize these properties, we must understand magnetic switching to and from the vortex state. We used a "rigid-vortex approximation" to calculate the total magnetic energy of a nanodot for various magnetic configurations. This was done for 20 nm-thick iron nanodots with different diameters (30, 40, 65, and 80 nm) as a function of applied magnetic field. By analyzing the energy landscape for different magnetic configurations, we calculated the energy barrier for switching from the vortex to the single-domain state (vortex annihilation) and the converse (vortex nucleation). The applied fields required to overcome these two barriers are compared to those obtained from the simulations directly and to the experimental values.[2] The role of the thermal fluctuations in the temperature dependence of these critical fields will be discussed by comparison of the energy barriers with the thermal energy, kT.

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[2]R. K. Dumas, C.-P. Li, I. V. Roshchin, I. K. Schuller and K. Liu, Appl. Phys. Lett. **91**, 202501 (2007).

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