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Quantitative studies of the vortex state in sub-100 nm magnetic nanodots. IGOR V. ROSHCHIN, CHANG-PENG LI, XAVIER BATLLE[1], S. ROY, S. K. SINHA, Physics Dept., UCSD, S. PARK, R. PYNN, M. R. FITZSIMMONS, LANL, J. MEJIA LOPEZ, Pontificia U. Catlica de Chile, D. ALTBIR, U. de Santiago de Chile, A. H. ROMERO, IPICyT, San Luis Potosi, Mexico, F. OTT, M. VIRET, C.E.A. Saclay, France, IVAN K. SCHULLER, Physics Dept., UCSD — Magnetism at nanoscale, when the size of the structures is comparable to or smaller than the ferromagnetic domain size, offers a great potential for new physics. Specifics of magnetic reversal in such structures are important for the high-density magnetic memory. Sub-100 nm magnetic dots are fabricated using self-assembled nanopores in anodized alumina [1]. Magnetization measurements performed using SQUID magnetometer indicate transition from a vortex to a single domain state for the Fe dots. This transition is studied as a function of the dot size and magnetic field. Monte Carlo and micromagnetic simulations confirm the experimental observations. Virgin curves measured at various temperatures indicate thermally activated vortex annihilation and nucleation. Quantitative analysis of the polarized neutron reflectometry in small angle geometry yields the vortex core size of $\sim$14 nm, in a good agreement with the 13 nm obtained from the simulations. Work supported by AFOSR. [1] Kai Liu et al., Applied Physics Letters **81**, 4434 (2002).

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