

Measurement of the vortex core in sub-100 nm Fe dots using polarized neutron scattering

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Abstract

We use polarized neutron scattering to obtain quantitative information about the magnetic state of sub-100 nm circular magnetic dots. Evidence for the transition from a single domain to a vortex state, as a function of the dot diameter and magnetic field, is found from magnetization curves and confirmed by micromagnetic and Monte-Carlo simulations. For 20 nm-thick Fe dots with diameters close to 60 nm, the vortex is the ground state. The magnetization of the vortex core (140 ± 50 emu/cm³) and its diameter (19 ± 4 nm) obtained from polarized neutron scattering are in agreement with simulations.