Micromagnetic Structures Near a Second Order Phase Transition In Monocrystalline Iron Garnet Plates

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The main parameters of micromagnetic structure (MMS) formation in a vicinity of a second order phase transition were determined experimentally and theoretically. The theoretical study was performed using micromagnetic approach. External magnetic field H_c of appearance of MMS and MMS period L_c were determined for (001)-oriented plate with uniaxial K_u and cubic K_1 magnetic anisotropy. The plate was saturated by the field applied in its plane. In the model we assumed that magnetization vector undergoes small deviations from equilibrium if magnetic field is slightly reduced. These deviations are periodic in nature: MMS has the form of a plane wave. Dependencies of H_c and L_c on an azimuthal angle of external magnetic field and on anisotropy constants K_u and K_1 were derived analytically in this work. Experimental studies of MMS near the second order phase transition were conducted on $(EuEr)_3(FeGa)_5O_{12}$ (001)-oriented 50 μm thick ferrite-garnet plate with $K_u = 5700$ erg/cm^3 and $K_1 = -3700$ erg/cm^3. MMS was revealed by means of magnetooptic Faraday effect. The in-plane field was increased up to 2000 Oe. Experimentally determined values of H_c and L_c were compared with theoretical estimates.