ABSTRACTS

EASTMAG-2016

VI Euro-Asian Symposium
"Trends in MAGnetism"

August 15-19, 2016, Krasnoyarsk, Russia

Artificial dense lattice of magnetic skyrmionic bubbles in Co/Pt multilayers

O10.2

M.V. Sapozhnikov[1], S.N. Vdovichev[1], O.L. Ermolaeva[1], N.S. Gusev[1], A.A. Fraerman[1], S.A. Gusev[1] and Yu.V. Petrov[2]

[1]*Institute for Physics of Microstructures RAS, Nizhny Novgorod, GSP-105, Russia*

[2]*Saint Petersburg state University, St.Petersburg, Universitetskaya nab. 7/9, 199034, Russia*

keywords: *magnetic skyrmion, nanomodification, perpendicular anisotropy*

Co/Pt superlattices with perpendicular magnetic anisotropy are irradiated by focused He^+ ion beam to locally change the anisotropy value. The irradiated areas have 100 nm diameter and are arranged in the square lattice with 200 nm period. While there are no changes in the film topography the formation of the nonuniform periodic magnetic structure is observed due to the local decrease of the anisotropy value in the irradiated areas. The spatial symmetry of magnetic force microscopy (MFM) signal together with specific shape of the magnetization curves indicates the formation of the dense lattice of magnetic skyrmions (for the irradiation dose of 2×10^{15} ions/cm^2) or magnetic vortices with the perpendicularly magnetized area between them (the dose of $3\div4\times10^{15}$ ions/cm^2). While the skyrmions demonstrate the absence of the MFM contrast on the background of the reversed domains (Figure 1 D, left), in the case of the «vortex» the magnetization lies in the plain so it will demonstrate the MFM contrast independently on the up or down direction of the magnetization of the surrounding area (Figure 1 D, right).

The micromagnetic simulations of the system are used to calculate the magnetization curve of the system. The difference between the measured and calculated curves can be explained by additional topological contribution to the Hall effect.

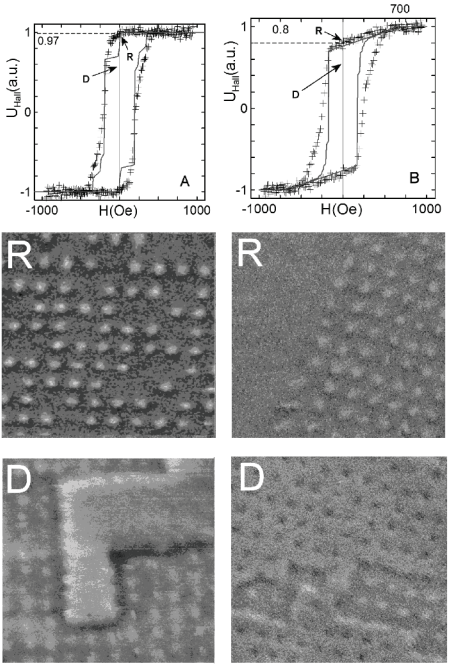

Figure 1. The left column: the data for the sample with low dose irradiation (2×10^{15} ions/cm^2), the right – for a sample with a higher dose (3×10^{15} ions/cm^2). From top to bottom: the hysteresis of the Hall effect (the crosses are for experimental data, the line is for calculation), (R) MFM images of the remanent state of the sample, (D) MFM image of the demagnetized state. The scan size is 2μm×2μm.