

Fabrication of ordered magnetic nanostructures with focused helium ion beam

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Local magnetization distributions usually referred to as “magnetic skyrmions” can be used in spintronic memory devices [1]. One of the methods, which are used to create magnetic skyrmions, is local modification of the magnetic anisotropy of multilayer films. Such modification can be performed by means of ion irradiation [2]. In this work we demonstrate the modification of Co/Pt film by means of local irradiation with focused helium ion beam. Films, consisting of several layers of 0.5nm-thick Co and 1nm-thick Pt, were grown on Si₃N₄ membranes or silicon substrates by means of magnetron sputtering. Irradiation was performed using a helium ion microscope Zeiss Orion. Irradiated samples were investigated by means of Lorenz transmission electron microscope (LTEM) using Carl Zeiss LIBRA 200MC and FEI Titan microscopes.

Ion induced mixing of cobalt and platinum layers result in reduction of perpendicular magnetic anisotropy. Observed LTEM contrast (fig.1) shows that local magnetic vortices or skyrmions can be obtained by means of local irradiation with focused helium ion beam.

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References

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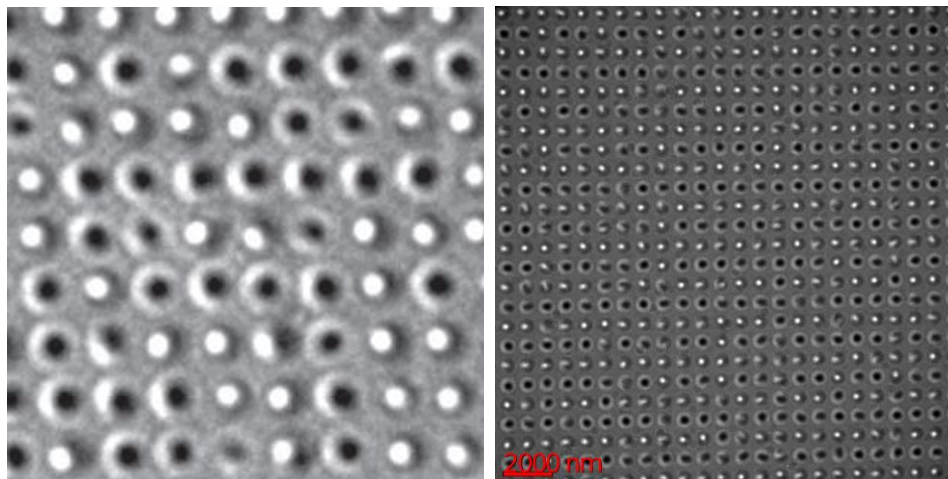


Figure 1. (a) Fresnel TEM image of irradiated structures, diameter - 200 nm, ion fluence - $2 \cdot 10^{15} \text{ cm}^{-2}$; (b) LTEM image of irradiated structures diameter - 400 nm, ion fluence - $4 \cdot 10^{15} \text{ cm}^{-2}$