

Selective modification of magnetic properties of Co₁/Au/Co₂/Au multilayers by He ion bombardment

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The possibility to locally change the properties of magnetic thin film materials is becoming increasingly important in view of their applications in magnetic storage elements. Particularly interesting, promising higher storage densities, are systems displaying perpendicular magnetic anisotropy. We show that in [Co₁/Au/Co₂/Au]_N ($N = 2\div 4$) multilayers (MLs), where Co₁₍₂₎ denote the Co layers of different thickness, the 10 keV He-ion bombardment (IB) leads to changes of the easy direction from out-of-plane to in-plane in thicker Co layers ($t_{\text{Co1}} = 1$ nm) while the perpendicular anisotropy of thinner Co layers ($t_{\text{Co1}} = 0.6$ nm) is preserved. The investigated MLs were obtained by sputtering and the thickness of Au layers ($t_{\text{Au}} = 4\div 6$ nm) ensured that the influence of direct coupling between Co layers (through pinholes) and RKKY-like interactions were negligible. It is shown that IB with ion doses ranging from 6 to 8×10^{14} ions cm⁻² leads to changes of magnetoresistance dependencies which correlate well with the magnetization changes observed by magnetometry. The X-ray diffraction measurements show no significant changes of MLs microstructure related to IB.

9.7 cm

13.4 cm

Subject category :

5. Nano-structure, Surfaces, and Interfaces

Presentation mode :

poster

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