Simulation of defects and composition after irradiation of ultrathin Pt/Co/Pt film Ga^+

B. Liedke[a], S. Facsko[a], J. Fassbender[a], J. Jaworowicz[b,c], J. Ferre[c], A. Maziewski[b], N. Vernier[c,d]

[a]Inst. of Ion Beam Phys. & Mat. Res., FZ Dresden-Rossendorf, Dresden, Germany
[b]Faculty of Physics, ul. Lipowa 41, 15-950 Bialystok, Poland
[c]Lab. de Phys. des Solides, UMR CNRS 8502, Univ. Paris-Sud, 91405 Orsay, France
[d]Institut d'Electronicque Fondamentale, Universite Paris-Sud, 91405 Orsay, France

9.7 cm

Spin reorientation transition from in-plane to out-of-plane state in $Pt/t_{Co}/Pt$ film (t_{Co} = 3nm) after 30 keV Ga^+ ion irradiation was observed [1]. Theoretical studies of the collision intermixing and defects creation processes of irradiated are presented. By means of TRIDYN simulations the dependence of composition and sputtering yield on ion fluence in the range of 10^{14} to $5*10^{16}$ ions/cm^2 is elucidated. Simulations show that ion fluence plays non-neglectable role in case of erosion and intermixing of the interface (which likely gives a certain strain to the system), which give rise to the new phenomena, the so-called swelling effect. On the other hand the swelling effect can relax the strain in the film and give rise to an increase of the magnetic anisotropy. However, the strain relaxation can be strongly non-uniform on the full square area providing a mixture of patches with in-plane or out-of-plane anisotropy. The presence of relatively large and quasi-uniform perpendicular anisotropy partially comes from peculiar strain states at the interface. Simulated compositions are compared with experimentally observed irradiation induced phenomena.

[1] J.Jaworowicz et al., Ga+ ion irradiation-induced out-of-plane magnetization in Pt/Co(3nm)/Pt films, work accepted for presentation in INTERMAG 2008.

13.4 cm

Subject category :

5. Nano-structure, Surfaces, and Interfaces

Presentation mode :
poster

Corresponding author :
J.Jaworowicz

Address for correspondence :
Faculty of Physics,
ul. Lipowa 41,
15-950 Bialystok,
Poland

Email address :
jawor@uwb.edu.pl