In-plane magnetic anisotropy symmetry in ultrathin Co films grown on sapphire substrates

A. Stupakiewicz[1], A. Maziewski[1], P. Trzciński[1], L.T. Baczewski[2], A. Wawro[2], and R. Kalinowski[2]

[1]*Institute of Experimental Physics, University of Białystok*
Lipowa 41, 15-424 Białystok, Poland
[2]*Institute of Physics, Polish Academy of Sciences*
Lotników 32/46, 02-668 Warsaw, Poland

We report on the study of in-plane magnetic anisotropy and magnetization reversal in ultrathin Au/Co/Au magnetic films epitaxially grown by MBE on sapphire substrates. The nanostructures deposited on sapphire single-crystal (11-20) wafers had the following composition: (i) first buffer layer of 20 nm Mo(110) deposited at T=1000^{o}C, (ii) second buffer layer of 10 nm Au(111) deposited at room temperature and annealed at T=200^{o}C for 15 min, (iii) 3 nm Co layer; (iv) 8 nm thick Au cover layer. The structure of the samples was monitored in-situ by RHEED. The study of magnetization processes was performed at room temperature using the magneto-optical polar Kerr effect based (MOKE) magnetometer. The longitudinal and transversal MOKE hysteresis loops measurements were performed in the magnetic field applied in different azimuthal orientations in the plane of the samples. Three magnetization components (polar, longitudinal and transversal) were measured and carefully separated using magneto-optical ellipsometer. The software operated directly via LabView is dedicated for automatic computer control of direction and amplitude of applied magnetic field and allows a real-time data analysis. In-plane magnetic anisotropy symmetry was deduced from the shape analysis of the magnetization curves - namely the value of magnetization remanence. The direction of easy magnetization axis in the sample plane is connected with in-plane anisotropy induced by a small nonintentional miscut of sapphire substrates. The in-plane magnetic anisotropy symmetry is correlated to the resulting preferentially oriented atomic steps on the surface of sample studied by in-situ STM.

Name of the presenting author (poster): Paweł Trzciński
e-mail address: and@uwb.edu.pl
url's: http://physics.uwb.edu.pl/zfmag/