Study of ultrathin Co films grown on Si(111) substrate

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In the present work we report on magnetization reversal and magnetic anisotropy in ultrathin Co films grown by molecular beam epitaxy on flat and vicinal Si(111) substrates. In addition to the magnetocrystalline anisotropy in magnetic Co films deposited on flat substrates, a uni-axial magnetic anisotropy in-plane is induced when the film is grown on a stepped surface. The following nanostructures were deposited on both flat and vicinal 2^o towards the [-1-12] direction Si(111) substrates. A buffer layer of 4 monolayer (ML) Cu is deposited at T=100^{o}C. The Co thickness layer is 3,5,7,15 ML and finally 30 ML thick Au cover layer. Measurements were performed at room temperature using magneto-optical Kerr effect (MOKE) based magnetometer, alternating gradient force magnetometer and ferromagnetic resonance X-band spectrometer. The longitudinal and transversal MOKE hysteresis loops measurements were performed with the magnetic field applied in different azimuthal orientations in the plane of the samples. For 15 ML thick film grown both on flat and vicinal were studied the azimuthal dependence of the coercive field in the sample plane. Symmetry of this dependence for vicinal sample is connected with competition of magnetocrystalline anisotropy and step-induced by monoatomic surface. Changes of in-plane magnetic anisotropy symmetry were deduced from shape analysis of the magnetization curves and angular dependence of the resonance field measured in the sample plane. The experimental data, will be discussed taking into account both magnetocrystalline anisotropy and step-induced uniaxial in-plane anisotropy [1]. Magnetic anisotropy constants are fitted. The in-plane magnetic anisotropy symmetry for vicinal sample is correlated to the resulting preferentially oriented atomic steps on the surface studied by *in-situ* STM.

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