Magnetic properties of sputtered Fe/Au multilayers

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The Fe/Au multilayered structures (MLS) exhibit many interesting physical properties depending on Fe, Au sublayer thicknesses, crystal structure and level of structure imperfections. We report studies on the temperature dependence of magnetic and magnetooptical properties for the series of Fe/Au (111) prepared by dc-sputtering on GaAs(001) substrates with the Fe sublayer thicknesses < 0.4 nm. The magnetization processes were measured by magneto-optical technique in polar and longitudinal geometry in the temperature range 8 - 315 K. The temperature evolution of the experimental Kerr hysteresis loops for the Fe/Au (111) MLS studied shows that the systems are composed of different magnetic phases. The observed in-plane and out of plane field dependences of Kerr angle exhibit superparamagnetic and ferromagnetic character depending on MLS sublayer thickness. To interpret quantitatively the experimental data we adopted the models developed by M.Rubinstein [1] and P.Allia [2]. In the frame of the models the developed fitting procedure was used in different temperature ranges to separate the superparamagnetic and ferromagnetic phases in the Fe/Au MLS. The analysis of the temperature dependences of the coercivity performed strongly supports the conclusion on increasing role of the superparamagnetic phase in the Fe/Au MLS with decreasing layers thickness ratio t_{Fe}/t_{Au} below 0.3. The role of interacting superparamagnetic phase related to the dipolar interacting uniaxial and randomly oriented nanoparticles is discussed.

[1] M.Rubinstein, V.G.Haris, B.N. Das and N.C. Koon, Phys.Rev. B50 (1994) 12550
[2] P. Allia, F. Celegato, M. Coisson, A. Da Re, F. Ronconi, F. Spizzo, P. Tiberto, and F.Vinai, J. Magn. Magn. Mater. **290-291** (2005) 580

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Poster

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