Nanoscale physics

Superparamagnetic magneto-optic properties of epitaxial $[Co(111)/Cu(111)]_{20}$ nanofilms, grown by magnetron sputtering

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Thin metal nanometer films, which consist of ferromagnetic (FM) and "nonmagnetic" normal (NM) metal layers, are nowadays popular objects of numerous investigations due to opportunity to use them in new information and sensor technology. Among them the prepared different ways sandwiches and multilayer Co/Cu films are known as magneto-resistive structures with giant magneto-resistive effect. If the thicknesses of copper layers in these films provide antiferromagnetic exchange coupling by means of Cu conductive electrons other physical features of such films can be changed. For example, there are works in which it is reported about enhancement of the magneto-optical Kerr effect in the FM/NM films.

In the work the results of magneto-resistive and magneto-optic studies of epitaxial $[Co(8Å)/Cu(d_{Cu})]_{20}$ nanofilms are reported. From analysis of magnetic field dependencies of magneto-resistivity changes and the magneto-optic Kerr effect it was drawn conclusion about existence of peculiarities of superparamagnetic cluster formations in the films. The sizes and amount of these clusters are significantly dependent on thicknesses of Cu layers. In the films with expected antiferromagnetic exchange coupling between Co layers the considerable augmentation of a superparamagnetic fraction was observed together with reduction of the average magnetic moment of clusters. The possible reasons dependence of the Co layers structure on the Cu layer thicknesses are discussed.