Abstract

The goal of this dissertation was to investigate the influence of the magnetic proximity effect on the magnetic properties of epitaxial multilayers with antiferromagnetic sublayers.

The study presents the influence of the proximity of an antiferromagnetic CoO(NiO) layer on magnetic properties of FeO in FeO/CoO epitaxial bilayers. With a use ofMössbauer spectroscopy, it was demonstrated that the magnetic proximity of CoO significantly increases the ordering temperature of thin wüstite from about 180 K to nearly 300 K in FeO/CoO. MOKE measurements performed for Fe/FeO/CoO(NiO) system showed that proximity of CoO(NiO) can significantly enhance the exchange bias interaction at the upper Fe/FeO interface. Moreover, the magnetic proximity effect led to the increase in the blocking temperature in Fe/FeO/CoO(NiO)trilayer compared to the Fe/FeO bilayer.

Magnetic properties of Co/NiO/Fe/W(110) system, were characterized with use of x-ray magnetic linear dichroism and x-ray magnetic circular dichroism. . It was demonstrated that the exchange interaction at the Co/NiO and NiO/Fe interfaces is responsible for the transfer of the magnetic properties of the lower Fe layer to the upper Co layer through the antiferromagnet. Transfer of magnetic properties from Fe film through NiO to Co layer is also reflected in the domain structure of sublayers, which was revealed with a use of PEEM microscope.

Magnetic properties of thin CoO layers grown on MgO(001) substrate were investigated using magneto-optical Kerr and Voigt microscopy. Magnetooptical studies showed evolution of domain structure in CoO as a function of antiferromagnet thickness. For Fe/CoO bilayer it was demonstrated how the presence of the ferromagnetic Fe layer influences the domain structure in CoO.

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