Interlayer exchange coupling in Co/Mo/Co trilayers.

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In this report, results on the study of magnetic and magneto-optical properties of Co/Mo/Co bilayers and Co/Mo trilayers are presented. The influence of the thickness of the Mo layer on the studied properties is considered.

The examined samples were prepared by DC magnetron sputtering technique. The thickness of the Co layer was equal to 2.5 nm. The thickness of the Mo layer, t_{Mo}, was varied from 0.5 to 10 nm. The structural investigations of the examined samples were performed by X-ray diffraction analysis. The measurements of hysteresis loops and spectral dependences of the transverse Kerr effect (TKE) of the samples were carried out employing magneto-optical magnetometer and spectrometer, respectively.

All examined samples were discovered to exhibit an in-plane easy axis of the magnetization (EAM). In bilayers, hysteresis loops along EAM have nearly rectangular shape. The reduced remanent magnetization is equal to 0.95-0.98. The observed insignificant variations of H_S as function of t_{Mo} (about 10 %) were explained by structural changes of bilayers.

In the case of trilayers, there are samples exhibiting nearly square loops and trilayers having complicated loops with high enough values of H_S and almost zero remanent magnetization. The values of H_S were found to oscillate with changing t_{Mo}. Period of oscillations is equal to 0.8 nm. These data were explained by exchange coupling between the Co layers through the nonmagnetic Mo spacer.

The examined samples exhibit identical magneto-optical spectra but values of TKE decrease with increasing t_{Mo}. That was ascribed to the appearance of a layer of Co-Mo alloy near the Co/Mo interface due to diffusion process. The influence of the Mo layer is stronger in trilayers than bilayers. For trilayers, TKE are larger (about 2 times) than for bilayers. These data were explained by the presence of two magnetic layers and two Co/Mo interfaces in trilayers.