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Computational analysis on the polar Kerr effect of Si_3N_4/(Fe,Co)Pt/Si_3N_4/Al on glass

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As one of the potential candidates for the advanced magneto-optical (MO) recording media, (Fe,Co)Pt has been spotlighted because it shows strong perpendicular magnetic anisotropy (PMA) attributed to the crystal structure of $L1_0$ type[1]. In the present paper we investigated the polar Kerr properties of (Fe,Co)Pt superlattice sandwiched between two isotropic dielectric layers on a glass substrate (n=1.5) coated with a 500 nm-thick aluminum layer. The reflectivity, Kerr rotation angle, and Kerr ellipticity of the multilayer were calculated using the dielectric tensors of each layer. The dielectric tensor of (Fe,Co)Pt superlattice was derived from the known optical conductivities (σ^1_{xx} and σ^2_{xy})[2-3] by using Kramers-Kronig transformation. Upon the assumption that the (Fe,Co)Pt film is uniform and perpendicularly magnetized to the interface plane, we investigated the variation of Kerr angle and ellipticity with both the thickness of the MO layer and the incident angle of the propagation vector. As one of the results, maximum Kerr angle occurred when a plane wave with the wavelength of red and blue wavelength is perpendicularly incident to the stacking multilayer embedding a very thin (Fe,Co)Pt layer less than 20 nm. At a wavelength of 405 nm that corresponds to a blue-ray zone showing great potential in the arena of magneto-optical data storage, the Kerr angle and ellipticity were very large. Based on the present multilayered structure, the polar Kerr effects of (Fe,Co)Pt superlattce was numerically scrutinized at a point of view of data storage.

References

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