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PROGRAM and ABSTRACT

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Magnetic and magneto-optical properties of hybrid multilayer nanostructures $\{[(Co_{41}Fe_{39}B_{20})_{33.9}(SiO_2)_{66.1}]/[ZnO]\}_n$

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The study presents the structural, magnetic, and magneto-optical properties of hybrid multilayers $\{[(Co_{41}Fe_{39}B_{20})_{33.9}(SiO_2)_{66.1}]/[ZnO]\}_n$, varying the layer thicknesses of the $(Co_{41}Fe_{39}B_{20})_{33.9}(SiO_2)_{66.1}$ nanocomposite and the ZnO semiconductor. The sample were synthesized by ion beam sputtering on a sapphire substrate [1]. The thin composite layers exhibit an amorphous structure, while ZnO semiconductor layers maintain a hexagonal crystalline structure with $P6_3mc$ symmetry group. The single-layer nanocomposite exists in a superparamagnetic state with a ferromagnetic component content far from the percolation threshold. The results of magnetic property measurements with VSM, as well as magneto-optical spectra and magnetoresistance, indicate that no long-range ferromagnetic order is formed in the studied multilayers at different ZnO interlayers up to 77 K.

Exploration of the magneto-optical properties of hybrid multilayers showcases their high sensitivity to structural parameters. Changing the thickness of the nonmagnetic ZnO interlayer led to the enhancement of the magneto-optical signal and to the appearance of new features in the spectral dependences of the TKE. Possible mechanisms for such enhancement are discussed.

References

[1] O.V. Dunets, Yu.E. Kalinin, M.A. Kashirin, A.V. Sitnikov. "*Electrical and magnetic properties of multilayer structures based on $(Co_{40}Fe_{40}B_{20})_{33.9}(SiO_2)_{66.1}$ composite*" // Journal of Technical Physics. - 2013. – Vol. 83. - P. 114-120.