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Effect of annealing in an external magnetic field on the microstructure and magnetic properties of the Fe/FePt/Pt multilayer system

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Abstract

The effect of annealing in an external magnetic field applied perpendicular to the plane of the film on the kinetics of Ll 0 phase transformation of the microstructure and the magnetic properties of the Fe(2 nm)/FePt(20 nm)/Pt(2 nm) multilayer system has been investigated. The relations between the hysteresis loop shape, magnetic correlation length, and structural disorders, which are characteristic of magnetic information carriers, have been analyzed. It has been found that the annealing of the Fe(2 nm)/FePt(20 nm)/Pt(2 nm) multilayer system at a temperature of 470°C in an external magnetic field of 3500 Oe, which is applied perpendicular to the film plane, leads to the formation of a face-centered tetragonal structure of the Ll 0 phase in the FePt film, which is characterized by the high coercivity H c, the (001) preferred texture, the magnetic anisotropy perpendicular to the film plane, small sizes of FePt grains in the film, and weak exchange coupling between the particles. The energy of the external magnetic field encourages the process of transformation of the FePt film into the Ll 0 phase. Thus, a method has been developed for fabricating multilayer films based on the FePt Ll 0 phase with the parameters necessary for information carrier materials with perpendicular-type magnetic recording. © 2012 Pleiades Publishing, Ltd.

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