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Effect of the CrW sublayer on the structure and magnetic properties of thin FePt films

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Abstract

Multilayer Fe 55Pt 45(20 nm)/Pt(5 nm)/Cr 100 - xW x(80 nm)/glass structures, in which the Fe 55Pt 45 magnetic film has a face-centered tetragonal (FCT) structure of the L1 0 phase with the (001) texture, have been prepared using magnetron sputtering. The microstructure and texture of the FePt films have been studied as functions of the W content in the Cr 100 - xW x sublayer, where $0 < x < 25$. It has been established that an increase in the W ion concentration leads to the formation of the (200) texture in the Cr 100 - x sublayer and to an increase in the Cr lattice constant. This is accompanied by a decrease in the temperature at which the facecentered cubic phase transforms into the FCT phase of the FePt films as a result of the increase in tensile stresses along the a axis. It has been found that the coercivity of FePt films deposited on CrW substrates increases with increasing W content in the Cr 100 - xW x sublayer because the CrW alloy thus formed precludes diffusion between the FePt film and the CrW sublayer. An additional 5-nm-thick intermediate Pt layer is also deposited to suppress diffusion between the FePt and CrW layers. As a result, the highly textured FePt(001) films intended for ultra-high density magnetic information recording are deposited on a substrate heated to a temperature of 400°C and the Cr 85W1 15 sublayer. © 2012 Pleiades Publishing, Ltd.

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