Physico-Chemical nanomaterials science.

The properties of Fe-Bi-Pt films obtained by ion-plasma sputtering

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Significant interest in studying of FePt and FeBi alloys conditioned by a manifestation of high coercivity and residual magnetization, which is typical for high magnetic materials [1]. Studies was carried out on thin films, with compositions (at.%): $Fe_{64}Pt_{20}Bi_{16}$ (composition 1); $Fe_{71}Pt_{20}Bi_9$ (2); $Fe_{80}Pt_{11}Bi_9$ (3); $Fe_{71}Pt_{20}Bi_9$ (4-5). Films with thicknesses about d ~ 150 - 65 nm was obtained by a modernized three-electrode ion-plasma sputtering [2] under various deposition conditions.

In the FePtBi films as shown X-ray studies, in the initial state there are a mixture of the nanocrystalline phase (with CSR size L ~2.1-2.2 nm) and traces of $PbBi_2$ phase. After heat treatment in vacuum at a temperature of 770-780 K we saw fcc FePt (a=0.3724-0.3707 nm), $PbBi_2$ phase and traces of FeO.

The FePtBi films (composition 3-4) are characterized by anisotropy of magnetic properties. In the perpendicular magnetic field orientation, the films are showing the weak hysteresis properties. The coercivity does not exceed 0.16 kA/m in the initial state in parallel fields. The decomposition of NCP after heat treatment at 770 K and formation supersaturated solid solution of FePt leads to an increase in coercivity up to 11 kA/m. Heating above this temperature leads to the oxidation, which leads to significant deterioration of magnetic properties. Thus, improvement of magnetic characteristics can be realized by choosing holding time at a predetermined temperature. The $Fe_{80}Pt_{11}Bi_9$ and $Fe_{85}Pt_6Bi_9$ films are characterized precision value of temperature coefficient of resistance $3\text{-}610^{-5}$ K^{-1} in initial state

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