MAGNETIC PROPETIES AND ANISOTROPY IN THIN FILMS OF ALLOYS $Co_{50}Pt_{50}$, $Co_{50}Pt_{50-x}Pd_x$.

E.M.Artemyev , L.E.Yakimov
Siberian Federal University, Krasnoyarsk, Russia
e-mail: aem49@yandex.ru

Film samples give an opportunity to study metastable structural condition of film material at normal conditions as well as after their variation in wide range. This work is devoted to studying of structure and magnetic characteristics of thin films of alloys $Co_{50}Pt_{50}$ and $Co_{50}Pt_{50-x}Pd_x$, where x = 1-10 at %. Thin films of alloys were produced with the method of magnetron deposition of initial clear elements on class and MgO bases and also with the method of thermal evaporation of alloy of appropriate composition in vacuum and following condensation of it's vapour on preheated up to 180 -220° C crystals-bases MgO, LiF and also on glass. Films' compositions and thickness were controlled with the method of x-ray fluorescent analysis. In presented work films 100-600 Å thick were studied. Films produced according to the methods described above had face-centered cubic lattice. Monocrystal films grown on crystals-bases MgO and LiF had face-centered cubic lattice that is orientated according to the parallel circuit toward the base. To reach necessary degree of long-range order in films, they were annealed in vacuum at the temperature lower than their Kurnakov point. After annealing in films of alloys formation of ordered phase $L1_0$ (tetragonal face-centered latitude with axes ratio c/a<1) was evidenced; moreover, orientation of tetragonal crystals toward the film's plane depends on film's thickness. In films up to 100-300Å thick crystals of tetragonal phase are orientated perpendicular to the film's plane with their "c" axis (there is no {100} type reflections on electron-diffraction pattern). In thicker films (with three "c" axis directions) areas where bands of different contrasts are alternated along directions [100] are evidenced. Magnetic anisotropy experience essential changes in the time of ordered tetragonal phase formation. Since "c" axis of tetragonal phases $Co_{50}Pt_{50}$ and $Co_{50}Pt_{50-x}Pd_x$ is the axis of light magnetization, thin films of ordered alloys become magnetically uniaxial with easy axis perpendicular to their plane. Magnetic crystallographic anisotropy constants equal $(4\text{-}4{,}5)10^7$ erg/cm^3 for $Co_{50}Pt_{50}$ films and $(3{,}5\text{-}4)10^7$ erg/cm^3 for $Co_{50}Pt_{50-x}Pd_x$ films. These values exceed form anisotropy values and films stay homogeneously magnetized perpendicular their plane in the absence of magnetic field and can be used for thermomagnetic information recording and storage [1]. With the palladium content increase coercive field strength of $Co_{50}Pt_{50-x}Pd_x$ films gradually decreases and for alloys with 7-8 at% Pd it is 6-9 kOe. Specific Faraday rotation (F) depends on film thickness. $Co_{50}Pt_{50}$ films 100-130 Å thick have the greatest specific rotation, in this films F reaches $9*10^5$ degree/cm when wave length is λ=1.2 μm. In thicker films specific rotation decreases. This difference should be on account of appearance of tetragonal crystals in thicker film, whose "c" axes lie in a film's plane. As a result total technical saturation of film along it's perpendicular needs application of larger fields. Optical absorption coefficient doesn't depend on wave length and film thickness and lies in the $(1.0\text{-}1.5)*10^5$ cm^{-1} range. Conducted research allows to draw a conclusion that magnetic characteristics of $Co_{50}Pt_{50-x}Pd_x$ films (x=1-10 at%) enable us to use them as a material for thermomagnetic information recording and storage. Great chemical durability of these films of alloys should be highlighted; films with no coating can be kept in contact with air during few years without changing their characteristics.

[1] E.M.Artemyev, A.E.Busmakov, Patent RU №2293377 C1 Alloy for thermomagnetic recording medium. Precedence 8 July 2005