PB12

Electron Spin Resonance of Dodecylamine-intercalated Vanadium Oxide Layered Structure Compounds

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Dodecylamine-intercalated vanadium oxide layered structure compounds, whose vanadium oxide layers are considered to be similar to those of vanadium-oxide nanotubes, were studied by means of electron spin resonance (ESR). The layered compounds were obtained from V_2O_5 powderdodecylamine in a molar ratio of 2:1, which were addedto ethanol and submitted to stirring for 2h in air. The amine molecules are hydrolyzed during the above process. The ESR spectra were composed of two Lorentzian lines. One of two Lorentzian lines showed marked changes around 270 K. The linewidth rapidly increases and the resonance field drastically decrease with decreasing temperature below 270 K, indicating a ferromagnetic transition around 270 K. On the other hands, the other Lorentzian line remained paramagnetic over the whole temperature investigated. The linewidth increases with increasing temperature, presumably attributed to hopping of holes. The spin susceptibility decrease with increasing temperature in the low temperature region and increases with increasing temperature in the high temperature region.

PC01

Lattice Expansion by Oxygen Addition to Control Crystallographic Orientations in Chemically Ordered $L1_0$ FePt Films

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Previously, CoCrPt films were deposited in an argon-oxygen gas mixture, which led the magnetic CoCrPtO layer to a segregation structure with thick oxygen-rich boundaries [1]. A similar approach was made in FePt film deposition. $L1_0$ FePt thin films in reactive oxygen sputtering were fabricated on polycrystalline glass substrates, and the magnetic properties and crystallographic orientations of the films were investigated.

Fig. 1 shows in-plane grazing incidence X-ray diffraction (GIXRD) for as-deposited FePt films. By varying oxygen volume fraction (O_2/Ar ratio) during deposition, the FePt growth texture vastly changed. Both FePt (111) and (200) peaks were present for no oxygen (pure argon), suggesting random orientations in these films. On the other hand, for an oxygen ratio of 1.5-3.0 vol.%, the (200) reflection from the FePt films was primarily present. This suggests that disordered FCC FePt (200) films be heteroepitaxially grown on the MgO (200)/Ag (200) underlayers. As also indicated by the dotted lines, the in-plane lattice parameter of the FePt films significantly expanded, showing the FCC FePt (200) peak shifts to the left. This corresponds to a reduction in the lattice misfit with the Ag (200) from 6.3 to 3.9%.

In Fig. 2, the magnetic properties of the FePt films are shown as a function of post-annealing temperature. The films were all made in the medium oxygen range (1.5-3.0 vol.%) to obtain FCC FePt (001) perpendicular texture. Both in-plane and out-of-plane coercivities (H_c) increased with increasing annealing temperature up to 650℃. It is interesting to note that the in-plane H_c sharply decreased when the films were annealed at 700℃ while the out-of-plane H_c continued to increase: the corresponding hysteresis gives a coercivity H_c = 8.8 kOe, a nucleation field H_n = -5.0 kOe, and a remanent squareness S = 1 with a sheared coercivity slope α ($=4\pi \cdot (dM/dH)_{Hc}$) of 1.6. In this work, we will further examine the effect of oxygen addition on the FePt microstructure in terms of grain size.

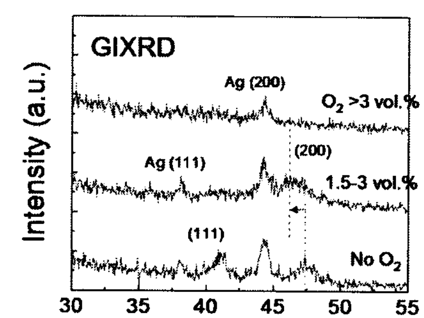

Fig. 1. GIXRD spectra as a function of O_2/Ar volume fraction during the FePt deposition.

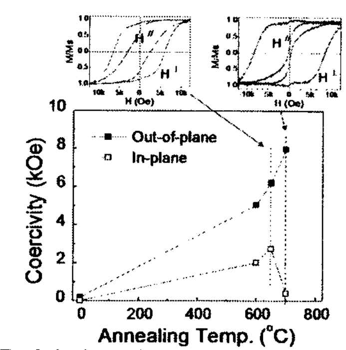

Fig. 2. In-plane and out-of-plane H_c vs annealing temperature.

REFERENCES

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