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ENHANCED MAGNETO-OPTICAL PROPERTIES AND LOW-TEMPERATURE PROPERTIES OF Co-Pt ALLOY FILMS

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INTRODUCTION

The Co-Pt alloy films are of interest for a magneto-optical (MO) recording media due to their enhanced magneto-optical properties at shorter wavelength and easier fabrication than Co/Pt multilayered (ML) films. We investigated the MO properties and low-temperature (LT) properties, which were, in addition, correlated to the measured structures and stoichiometry. The results were also compared with those of the Co/Pt ML films.

EXPERIMENT

The CoPt and $CoPt_3$ films of 200 Å thick on single-crystalline Si substrates with Pt buffer layers of 200 Å thick were prepared by ultrahigh-vacuum cosputtering. The MO properties of the films were investigated at both room temperature (RT) and LT with Kerr loop tracers at 4579 Å, 4880 Å, 5145 Å and 6328 Å. The magnetic properties at LT were obtained with a SQUID magnetometer. Their structures and stoichiometry were measured by x-ray diffraction (XRD), atomic force microscopy (AFM), magnetic force microscopy (MFM), and photoemission spectroscopy(PES).

RESULT AND DISCUSSION

The XRD results show a film texture of (111). The rms surface roughness of CoPt is 0.79 Å by AFM, which is smaller than that of $CoPt_3$ (2.1 Å). This may be relevant to the reported different atomic structures.

The stoichiometry of the films were confirmed by using Co $2p_{3/2}$ and Pt 4f PES peaks, and no impurity was found in the films by in-situ PES. The Co 3d, 3p and 3s peaks, the Pt 5d, 4f, 5p and 4d peaks, and the valence bands were measured at RT and 150 K, and at photon energies varied from 60 to 500 eV by synchrotron-radiation PES. The analysis is carried out.

The Kerr rotation angles (θ_k) at both RT and LT of the $CoPt_3$ films are increased with respect to photon energy. In addition, these values for θ_k at RT are all larger than those of Pt(10Å)/Co(3Å) ML film, and the reasons are suggested. The measurements of θ_k at LT showed a larger increase rate with respect to photon energy at lower temperature, and θ_k at 2.71 eV (4579 Å) turns out to be 0.361° at 200 K, 0.385° at 77 K, and 0.426° at 5 K. The results of the CoPt films are also compared with those of the $CoPt_3$ films.

The saturated and remanent magnetization of the CoPt film increase linearly with decreasing the measurement temperature, while the coercivity increases remarkably at 5 K. The detailed discussion will be presented, together with other measurement and analysis results.