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PROPERTIES OF ION BEAM MIXED Co/Pt MULTILAYERED FILMS AND Co-Pt ALLOY FILMS

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Co-Pt alloy films have attracted wide interests as high density magneto-optical recording media due to their large polar Kerr rotation angle at short optical wavelengths, large perpendicular magnetic anisotropy, good corrosion resistance, and easy fabrication. Ion beam mixing with or without a magnetic field of the multilayered films may provide another way to produce films with equivalent magnetic and magneto-optical properties to the alloy films. Ion beam mixed Co/Pt multilayered films were prepared in a magnetic field for their overall compositions to be CoPt and $CoPt_3$, which are expected to have different structures and, in turn, different magnetic and magneto-optical properties, and the properties were investigated and compared with those of the corresponding alloy films.

(43.7Å Co / 131.3Å Pt) x 4 and (87.5Å Co / 87.5Å Pt) x 4 multilayered films were deposited onto Si substrates at 30 - 80°C in a high vacuum by alternating electron-beam evaporation. The total thickness of multilayered films are adjusted to be the projected range of 80 keV Ar^+ ions determined by a TRIM code simulation. The prepared multilayered films were mixed by 80 keV Ar^+ with a dose of 1.5×10^{16} ions/cm^2. The ion beam current was maintained at 600 nA so as not to heat up the films. A magnetic field of 800 G was applied to the films with a permanent magnet during ion beam mixing. Co-Pt alloy films were prepared at around room temperature by ultrahigh-vacuum cosputtering ; CoPt 200 Å / Pt 200 Å / Si and $CoPt_3$ 200 Å / Pt 200 Å / Si.

We investigated the magnetic and magneto-optical properties at both room and low temperatures, which were also correlated to the measured structures and stoichiometry.

The goemetrical, magnetic and electronic structures, and the compositions of the films were determined using x-ray diffraction, atomic force microscopy, magnetic force microscopy, and photoemission spectroscopy. The magneto-optical properties were investigated at both room and low temperatures with Kerr loop tracers at 457.9 nm, 488 nm, 514.5 nm and 632.8 nm, and the magnetic properties were also measured at room temperature, 77 K and 5 K with a vibrating sample magnetometer and a SQUID magnetometer.

The detailed results and discussion will be presented, including the comparison between ion beam mixed and alloy films, and the feasibility of the ion beam mixed film in magnetic field as a high density magneto-optical recording medium.