

Abstract

Magnetic structures, methods of fabricating magnetic structures and micro-devices incorporating such magnetic structures

Highly coercive (out-of-plane) hard magnetic films of cobalt-platinum-phosphorus (CoPtP) composition doped with tungsten (W) were fabricated by direct current (DC) galvanostatic electrodeposition. With the addition of 0.003 mol/L of W in the electrolyte solution for CoPtP, coercivity (H_c) of about 3664 – 3784 Oe, absolute remanent magnetization (M_r) of 7.8 – 8.4 memu, and squareness (S) of about 0.53 – 0.55 were achieved for electroplated CoPtWP single-layered film. Upon annealing in ambient atmosphere at 320°C for 2hrs, an improvement in magnetic property was observed with H_c of about 4211 - 4619 Oe, an absolute M_r of about 7.0 - 8.4 memu, and a S of about 0.68 - 0.85. Annealing in air caused oxidation of the CoPtWP leading to a slight decrease in absolute M_s and M_r but a marked improvement in H_c and S due to the presence of non-magnetic metallic oxides formed at the grain boundaries. To achieve higher absolute magnetization, CoPtWP/Au multilayered structures were fabricated by a stepwise plating process. In comparison to a single layered film, a 3-layered structure exhibited a higher absolute M_r of about 14.9 memu, H_c of about 3927 Oe with S about 0.58 after annealing at 320°C for 3 hrs via a separate annealing sequence.

[Fig. 6]



162162



G00002