

Analysis of postannealing effect on magnetic properties and microstructure of CoCrPt-SiO₂ perpendicular magnetic recording media

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Postannealing is effective in improving the signal-to-noise ratio of CoCr-alloy media by means of Cr segregation at grain boundaries [1]. We reported the postannealing effects of CoCrPt-SiO₂/Ru PMR media on magnetic properties and microstructure in previous work and this time we analyzed the results in detail. CoCrPt-SiO₂ thin films were deposited on surface oxidized Si wafer by DC magnetron sputtering at room temperature, followed by postannealing for 15 minutes with annealing temperature varied from 100°C to 240°C. Coercivity (H_c) and negative nucleation field (H_n) increase with annealing temperature then lessen at higher annealing temperature than 180 °C. This behavior is in accordance with Co peak position vs. annealing temperature. Peak position shift may be caused by stress induced on the film by postannealing. On the contrary, saturated magnetization values and slope of hysteresis loop abruptly increase upon higher temperature than 180°C. Anisotropy energy (K_u) also linearly increases with annealing temperature. X-ray photoelectron spectroscopy reveals more explicit Cr oxide in postannealed media than as-deposited one near the interface with Ru underlayer. Above results indicate that Co grains are deprived of Cr by making Cr-oxide at the grain boundaries of initial layers. Improvement in exchange decoupling between Co grains at initial layers is attributed to the enhanced H_c and H_n.

1. Y. Hirayama, Y. Honda, A. Kikukawa, and M. Futamoto, J. Appl. Phys. 87, 6890 (2000).