Change in element distributions in FePt films with Ag or Cu additives associated with their crystallographic phase transformation throght thermal annealing

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The $L1_0$ $Fe_{50}Pt_{50}$ film has a very high-anisotropy constant $K_u \sim 7 \times 10^7$ erg/cc. However, the $L1_0$ structure needs a high formation temperature of over 500 °C, and so it is limited to select substrate materials. Many researchers have been reported to reduce the ordering temperature of the $L1_0$ structure of FePt. Although the addition of a third element (for example, Ag and Cu) is effective in reducing the ordering temperature, it is not clear what is reason for this reduce. In this study, we explore mechanism of reducing the ordering temperature to investigate distribution of additional elements in depth direction of film.

The $L1_0$ $Fe_{50}Pt_{50}$ alloy films with Ag and Cu additives were obtained by annealed over 500 °C in a vacuum. Their films have $L1_0$ crystalline structure as revealed by X-ray diffractmeter and their films obtained high H_c. Especially, an ordering temperature of these films were reduce to 400 °C form 500 °C when we added Ag of 3 at. % and Cu of 7 at. % to the films. Figure 1 shows Auger electron spectroscopy depth profiles of Ag for $(FePt)_{95}Ag_5$ films. Although Ag had wide distribution over film, Ag moved to surface of film with annealing at 600 °C. Additive of Cu also moved to the surface with annealing at 600 °C. It was considered that this move causes the reduce of the ordering temperature.

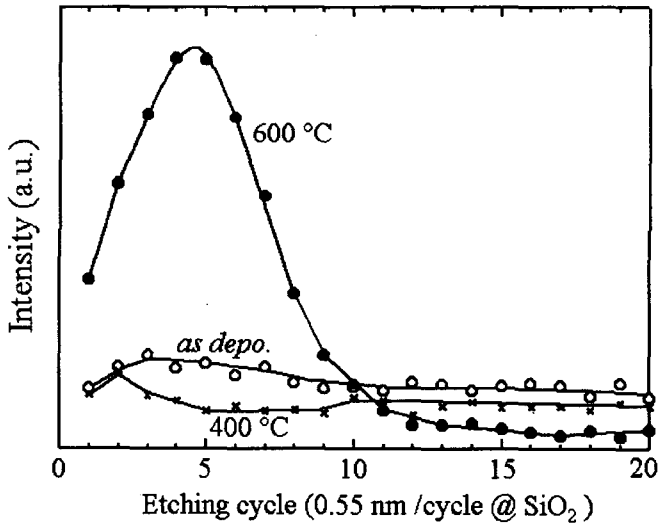

Fig.1. Depth distribution of Ag additive on $(Fe_{50}Pt_{50})_{95}Ag_5$ film at various annealing temperature.