

Ti buffer layer effect on crystal structure of annealed Co/Pt thin films

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Ordered-phase Co-Pt binary alloys, such as $L1_0$ -CoPt and $L1_2$ -CoPt₃, are considered as next-generation ferromagnetic materials with high uniaxial magnetocrystalline anisotropy and high coercivity [1]. In fabrication processes of such materials, buffer layers are often used to enhance crystal and magnetic properties of CoPt. Ti buffer layer is well-known for improving adhesion to substrates. Towards applications to spintronic devices, it is important to understand the Ti buffer layer effect on properties of fabricated CoPt. However, detail works related to Ti buffer layer effect on crystal structure of CoPt thin films have not been reported. In this study, we fabricate Co/Pt thin films onto Al₂O₃ substrates with and without Ti buffer layer by electron-beam evaporation. These films are subsequently annealed by a rapid thermal annealing (RTA) with a high heating rate to make ferromagnetic Co-Pt alloys. Their crystal structures are characterized by synchrotron X-ray diffraction at KEK (BL-8B). The diffraction patterns of the Co/Pt thin films (a) without and (b) with Ti buffer layer after annealing by RTA are shown in Fig. 1. For the film without Ti layer, the peaks originated from CoPt (pointed by the white arrows in Fig. 1) were observed, indicating that alloying occurred by annealing. On the other hand, not only the CoPt peaks but also the superlattice spot-like peaks originated from CoPt₃ 100 and 110 (pointed by the red arrows in Fig. 1. (b)) were observed for the film with Ti layer. These results suggest that Ti buffer layer contributed to the formation of $L1_2$ -CoPt₃.

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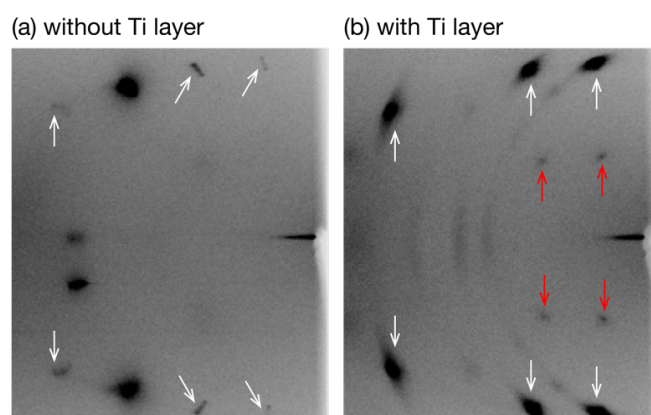


Fig. 1. Diffraction patterns of Co/Pt thin films (a) without and (b) with Ti buffer layer after annealing by RTA. The peaks originated from CoPt and CoPt₃ are marked by the white and red arrows, respectively.

[1] D. Weller and A. Moser, *IEEE Trans. Magn.*, **35**, 4423, 1999.