

## Correlation between Growth Stress and Microstructure in CoCrPt Alloy Thin Film with Nanogranular Structure

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CoCrPt alloy thin film is one of the most promising candidates for the high-density magnetic recording media since they provide desirable magnetic properties such as high coercivity and strong magnetocrystalline anisotropy for high-density recording. In the area of magnetic recording, one of interesting study is to investigate the growth stress, since stress inevitably generated in thin films during fabrication drastically alter the magnetic properties of ferromagnetic film and could cause mechanical deformations such as film fracture and film buckling [1,2]. In this study, we have investigated the *in situ* stress evolution and correlation between growth stress and microstructure in 400-Å (Co<sub>72</sub>Cr<sub>18</sub>)<sub>87</sub>Pt<sub>13</sub>/1100-Å Ti alloy film. CoCrPt alloy thin film with Ti bufferlayer was deposited onto a Si (001) substrate with 50 μm (t), 15 mm (l), 3 mm (w). The stress measurement was performed in an ultrahigh vacuum (UHV) chamber equipped with a highly sensitive optical deflection-detecting system. Fig. 1 shows the evolution of growth stress with as a function of the CoCrPt thickness. It is worthwhile to note that the growth stress shows a transition from tensile to compressive at the initial growth stage. A very large compressive stress is developed at the very beginning of CoCrPt alloy deposition, and it turns into a smaller tensile stress at about 5-Å CoCrPt thickness. After 20-Å CoCrPt deposition, the tensile stress again turns back to smaller compressive stress. To understand the stress evolution at the initial growth stage of CoCrPt, we have investigated the microstructure of CoCrPt film at the each transition thickness region via atomic force microscopy (AFM) and x-ray diffractometry (XRD). And, it revealed that microstructural changes play a major role for the observed stress variation in the thickness range from 5-Å to 20-Å.

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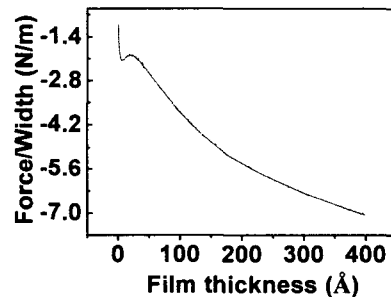


Fig. 1. Film force as a function of CoCrPt film thickness in 400-Å (Co<sub>72</sub>Cr<sub>18</sub>)<sub>87</sub>Pt<sub>13</sub>/1100-Å.

### References

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