1051, Bq-56

# Magnetic properties of Co/Ag/Co films grown on Ag(100) sub-micrometer islands

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In this study, magnetic properties of molecular beam epitaxy grown Co(5 nm)/Ag(3 nm)/Co(4 nm) films on Si(100) substrates with Ag(100) islands were studied. At first, we fabricated the surface roughness and pyramidal shape of Ag islands on Si(100) substrates as a template. Due to the surface energy consideration, Ag tends to self-assemble into regular and isolated islands and to roughen with deep groove-boundaries, as seen by atomic force microscopy. Surface roughness of the Ag(100) islands being depended on its thickness and deposition temperature as evidenced by AFM, provides us correlation between magnetic properties and interface roughness [1]. The Co/Ag/Co films were then grown onto the Ag films with different layer thickness (0~40 nm). The x-ray diffraction and reflection high-energy electron diffraction results demonstrated that Co/Ag/Co films on Si(100)/Ag are highly (100) textured. Thicker Ag buffer layer enhanced the formation of Co texture while increased the surface roughness as well. A magnetic anisotropy transition of Co/Ag/Co films from uniaxial into isotropic was observed by the longitudinal mode of magneto-optical Kerr effect with increasing Ag buffer thickness. Magnetization reversal process and the change in loop-shapes of also depend strongly on the Ag surface roughness. The resistivity and coercivity increased with increasing the roughness of Ag islands. However, in-plane demagnetization factor, *N*, also increased with surface roughness dramatically. The magnetoresistance measurements displayed a sharp degraded point at field *Hx*. The value of *Hx* increased linearly with the underlying Ag roughness. From the in-plane azimuthal analysis, a two-fold symmetry in Co/Ag/Co films without Ag buffer was found to change into a four-fold symmetry as the thickness of Ag under-layer reached 5 nm, as shown in Fig.1. Therefore, the roughened Ag(100) surface facilitates texture growth yet provides a resultant domain-wall-pinning which also dominated the magnetization reversal.

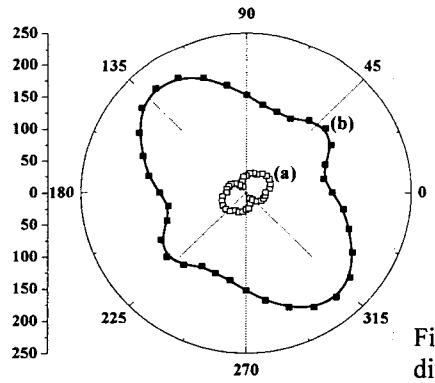


Fig.1. In-plane coercive field distribution of Co/Ag/Co films with different Ag under layer thickness: (a) 0 nm, (b) 5 nm.

## References

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