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계면 구조에 따른 Permalloy/Cu_xAg_{1-x} (x=0, 0.75) 거대자기저항 다층박막에서의 Antiferromagnetic coupling의 변화

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Giant magnetoresistive of antiferromagnetic coupling and interfacial structure in Permalloy/Cu_xAg_{1-x} multilayer

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I. Introductions

P. Parkin[1] discovered the antiferromagnetic coupling effect of interfacial structure in a magnetic multilayer thin film. Since then, much efforts have been focused to understand the relationship between the interface morphology and the antiferromagnetic coupling. The authors prepared magnetic multilayer films of Permalloy/Cu and peralloy/Cu-Ag. They intended to produce films of different interface roughness. The dependence of antiferromagnetic coupling on interface roughness will be discussed.

II. Experiments

Permalloy/Cu and Permalloy/Cu_3Ag multilayers were deposited on Si (100) single crystal by evaporation technique. The thickness of Permalloy layer was fixed to 10 Å and that of Cu layer was varied to 6, 8, 10, 12 15, 18, 20 Å, and that of Cu_3Ag was varied 10, 14, 15, 20 Å. The Cu_3Ag layer was grown by coevaporation of Cu and Ag. Surface roughness was measured by atomic force microscopy and interfacial roughness was analyzed by Rocking curves of satellite peaks in low angle XRD. Hysterisis curves were measured using a vibrating sample magnetometer.

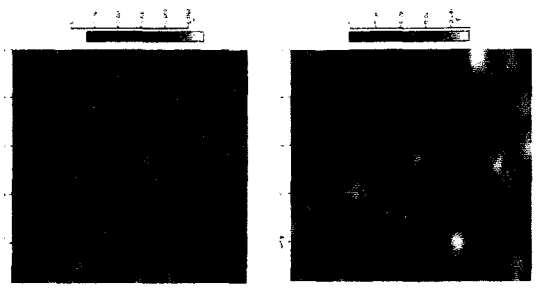
III. Results

Fig.1 shows AFM morphology Cu_2Ag 300 Å , CuAg 300 Å , and Ag 300 Å single layer thin films on Si (100). Though Ag coevaporated with Cu, Ag particles were formed due to low solubility in Cu. Spherical formed silver particles should make interface roughness. It was confirmed by the broadening of rocking curve line width. (Fig. 2)

IV.Conclusions

Addition of Ag in conductive Cu layer increase the interfacial roughness. As interfacial roughness increases, coersive field decreases and antiferromagnetic coupling increases.

(a) (b)



(c)

Fig 1. AFM morphologies of (a) Ag 300 Å (b) CuAg 300 Å (c) Cu_2Ag 300 Å on Si (100).

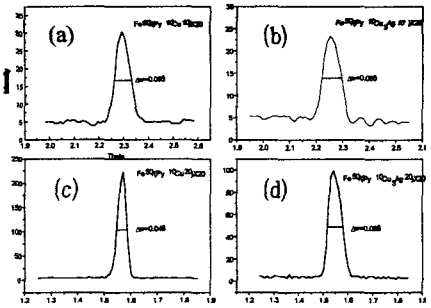


Fig.2 Broadening of line width in rocking curves.

(a) $Ni_{81}Fe_{19}$ (10Å)/Cu (10Å)

(b) $Ni_{81}Fe_{19}$ (10Å)/Cu_3Ag (10Å)

(c) $Ni_{81}Fe_{19}$ (10Å)/Cu(20Å)

(d) $Ni_{81}Fe_{19}$ (10Å)/Cu_3Ag (20Å)

V. Reference

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