

## X-ray magnetic circular dichroism on Co/N/Cu(001) surfaces

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### Introduction

When Cu(001) surface is covered with 0.3 mono-layer (ML) of nitrogen, square patches of N covered area arrange in 7nm periodicity, resulting in a grid pattern of Cu(001) clean surface with 2nm width. Co grows selectively at the cross of the grid and forms square arranged Co dots with 2ML height. When the Co coverage exceeds 1.6ML on average, the dots begin to coalesce. So far, we have investigated the growth and the magnetism of this surface by using scanning tunneling microscopy and magneto-optical Kerr effect[1]. In the present study, we have measured X-ray magnetic circular dichroism (XMCD) in X-ray absorption (XA) spectra to obtain further information about the electronic states and the magnetic moments on this surface.

### Experimental procedure

The experiments were performed at BL-7A and 11A. The sample was prepared by depositing 1.6-3.5ML Co on the substrate. We have confirmed the grid pattern of N/Cu(001) surface by using satellite spots of low-energy electron diffraction. Partial electron yield spectra were measured at N K- and Co L<sub>2,3</sub>-edges at room temperature and 110K. XMCD was obtained with in-plane remanent magnetization by applying pulsed magnetic field.

### Results and Discussion

Figure 1 shows XA spectra at N K-edge using linearly polarized light. The spectra show significant dependence on incident light polarization and changes by Co deposition. Co spreads on N covered area by increasing the coverage after the formation of Co dots array[1]. The present result shows significant interaction of Co with the substrate N at the interface. Assuming the growth mode to be pseudomorphic, the in-plane nearest neighbor of N atom is Cu while the out-of-plane is Co. The change of the spectra especially in the case of s-polarized light incidence suggests the change of *d*-state of Cu at the interface. Figure 2 shows Co coverage dependence of the ratio of orbital magnetic moment ( $M_L$ ) to effective spin magnetic moment ( $M_S$ ) obtained from series of XMCD spectra. The ratio for Co/N/Cu surface is larger than the bulk value ( $\sim 0.09$ ) and gradually increases with the decrease of coverage. This means relative increase of

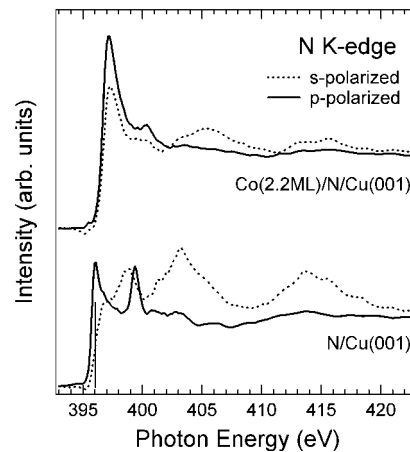


Figure 1: Change of N K-edge XA spectra.

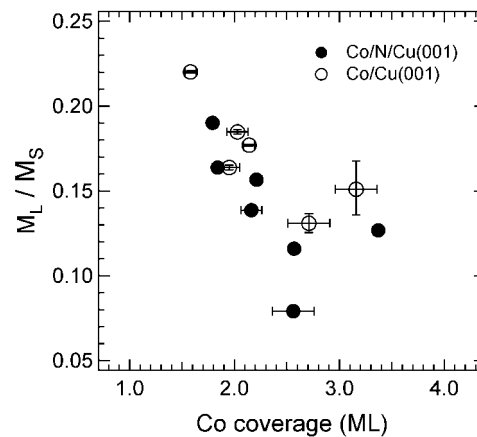


Figure 2: Co coverage dependence of  $M_L / M_S$  ratio on Co/N/Cu surfaces (filled circles) and continuous films (open circles).

orbital magnetic moment due to the decrease of dimensionality as in the case of Co thin films on clean Cu. The increment fashion is similar to the case of the Co continuous films in spite of the difference of morphology.

### References

[1] F. Komori *et al.*, J. Phys.:Condens. Matter **14**, 8177 (2002) and references therein.

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