18A/2000G174

Electronic structure of Cu-O/Ag(110)(2x2)p2mg surface

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Introduction

While ordinary oxygen adsorption on the Ag(110) surface causes –Ag-O- linear chain along the [001] direction, the co-adsorption of oxygen and Cu causes the (2x2)p2mg reconstruction[1]. On the co-adsorbed surface, the oxygen plays a role of surfactant between the two metals and -Cu-O- zigzag chains are formed along the [-110] direction. This structure is the same to that of the oxygen adsorbed (0.5 ML) Rh(110) surface. To study the driving force causing the p2mg structure, we are going to investigate the electronic structure of the Cu-O/Ag(110)(2x1)p2mg surface and compare the results with that of the Rh(110)(2x2)p2mg-O surface.

Experimental

Cu-O/Ag(110)(2x2)p2mg was made by Cu adsorption on the oxygen adsorbed Ag(110)p(2x1)-O surface. All adsorption was made at room temperature. In the ARUPS measurement, mainly 20 eV p-polarized light was used. The light incidence angle was set at 70 degree in the all measurement and photoelectrons are collected in the light incidence plane.

Results and Discussion

Fig. 1 shows the ARUPS spectra of the Cu-O/Ag(110)(2x2)p2mg surface (solid line) and the clean surface (dotted line) along [-110] direction. We can clearly observe a strong and non-dispersing band at near –3 eV. From the analysis of cross-section and peak intensity ratio, we conclude that these peaks can be assigned to the Cu3d states. On the other hand, there is a peaks dispersing from –2 to –1 eV. This band should be assigned to the oxygen 2p states. This band is folding at Γ^{2nd}, so it has a typical behavior of p2mg structure. There are some other fine structures on the spectra. They should be assigned by use of the comparison with tight-binding calculation and so on. Another interesting point is a Ag5sp band which is observed in both clean and p2mg surface. By adsorption of –Cu-O- chain, this 5sp band slightly shift to the Fermi level. To investigate origin of this phenomenon would be interesting.

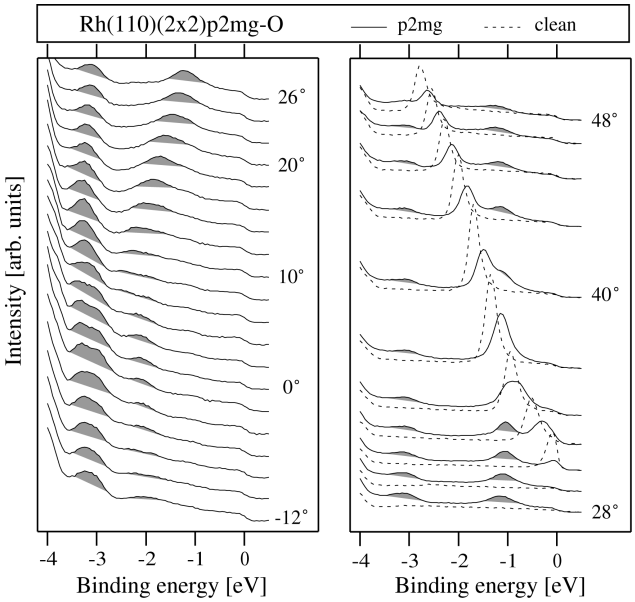

Fig. 1: ARUPS spectra of the Cu-O/Ag(110)(2x2)p2mg surface along [-110] direction. The dotted lines indicate the spectra of clean Ag(110) surface and solid lines indicate the Cu-O adsorbed surface.

References

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