Angle-resolved photoemission studies of Cu(104)-O surface

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Introduction

On metal crystal surfaces with atomically rough structures, faceting can be observed due to adsorption-induced reconstruction. The vicinal (11***n***) copper surface is known to facet to (104) in the presence of adsorbed oxygen [1]. The Cu(104)-O surface is characterized by the formation of Cu-O-Cu-O chains which are aligned along the [010] direction. The structure model of the Cu(104)-O surface is shown in Fig. 1. This surface is very similar to that proposed for the Cu(001)(2√2×√2)R45-O structure. In a recent papar [2], we report the electronic structure of Cu(001)(2√2×√2)R45-O surface studied by angle-resolved photoemisssion spectroscopy (ARUPS) and tight-binding calculation. We examine the electronic structure of the Cu(104)-O surface comparing with that of the Cu(001)(2√2×√2)R45-O surface.

Experimental

The angle-resolved photoemission measurements were made on BL-18A with an ADES-500 spectrometer. The clean Cu(104) surface was prepared by repeated Ar^+ sputtering and annealing cycles. We observed LEED patterns with sharp double spots, consistent with a regularly stepped surface structure. The Cu(104)-O surface was prepared by 50 Langmuir oxygen exposure at room temperature. The Cu(104)-O structure was verified by LEED.

Results and Discussion

Fig.2 shows angle-resolved energy distribution curves (AREDCs) of Cu(104)-O surface taken along [010] with hν=20 eV, p-polarization. O2p-derived features are indicated by tic marks in the figure. There are some oxygen-induced features in a region of –7 to –4 eV binding energy. This agrees well with the previous results of ARUPS for Cu(001)(2√2×√2)R45-O surface. We also observe an oxygen-induced feature at about –1.8 eV. We estimate this to anti-bonding states. These results will examine in terms of tight-binding model and compared with the electronic structures for Cu(001)(2√2×√2)R45-O and Cu(110)p(2×2)-O surfaces [3].

References

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[3] R. Ozawa et al., Surf. Sci., 346, 237 (1996).

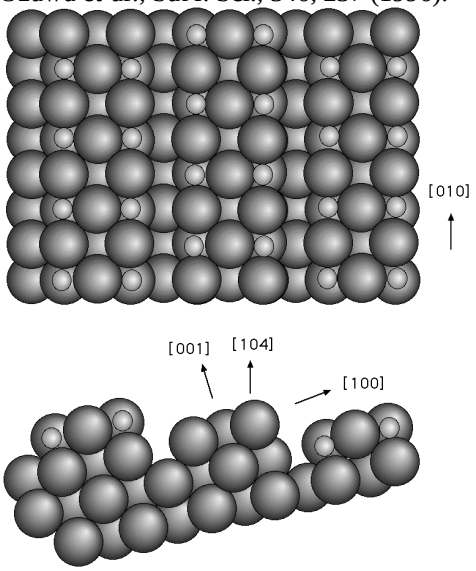

Fig.1. Structure model of the Cu(104)-O surface. Top: top view, bottom: side view. Small balls indicate oxygen atoms.

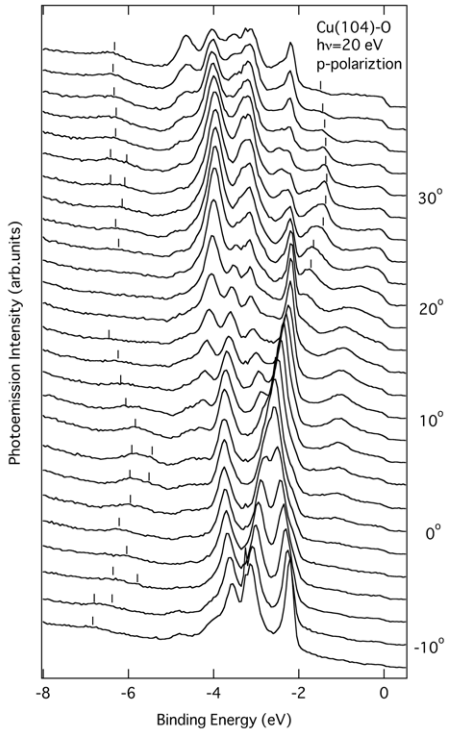

Fig.2. AREDCs of Cu(104)-O surface.

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