PARTIAL SPECTRAL WEIGHT OF Cu-Au ALLOYS DETERMINED WITH USE OF SYNCHROTRON RADIATION

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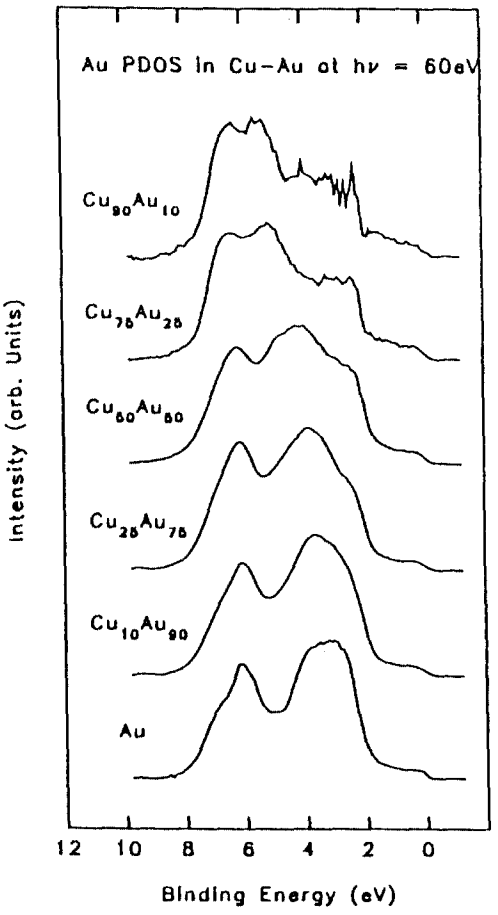
Compositionally disordered Cu-Au alloys have received much attention because they can give informations about the mechanism of band forming in binary alloys[1]. Experimental results indicate strong contribution of Au 5*d* states at binding energy (E_B) around 5~7 eV in Cu rich Cu-Au alloys and these results tempted some authors to conclude that Au partial DOS in Cu_3Au ordered alloy or in Au diluted Cu-Au alloys are confined within E_B = 5~7 eV and that Au 5*d* band and Cu 3*d* band separate and form split bands due to band repulsion[2].

We have determined partial spectral weight (PSW) of Cu_xAu_{1-x} using the Cooper minimum phenomena of Au 5*d* states at $h\nu \simeq 200$ eV. For this purpose, we measured angle-integrated photoemission spectra of Cu_xAu_{1-x} alloys at $h\nu$ = 60 eV and 160 eV. Using empirically determined photoionization cross sections of Au and Cu pure metals at these two photon energies, we then determined Au and Cu PSW of each Cu_xAu_{1-x} alloys self-consistently by iteration. We have considered the effects of surface segregation of Au and the change of the photoionization matrix element at different photon energies.

Figure shows empirical Au PSW of Cu_xAu_{1-x} at $h\nu$ = 60 eV. The density of Au 5*d* states at E_B = 2~4 eV decreases with decreasing Au content, but the intensity of these states is not negligible even for $Cu_{90}Au_{10}$. This is in contrast to the split-band picture, and bands in Au diluted Cu-Au alloys must be classified as common-band type. This can be understood since Au atomic site in Cu host is compressed and strong hybridization between different *d* states is expected.



1. J. Kudrnovský, S.K. Bose, and O.K. Andersen, Phys. Rev. B **43**, 4613 (1991), and references therein
2. W. Eberhardt, S.C. Wu, R.F. Garrett, D. Sondericker, and F. Jona, Phys. Rev. B **31**, 8285 (1985)