【M-01 : 분과초청】

XANES study of Co_xAl_{1-x} alloy films

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Transiton-metal(TM) aluminides are of considerable technological interest for high-temperature applications. The Co_xAl_{1-x} alloys exhibit different mechanical and magnetic properties according to the variation of Al concentration. In the electronic structure which can be related to the variations of macroscopic mechanical or magnetic properties. X-ray absorption near-edge structure (XANES) can provide complementary information concerning unoccupied states just above the Fermi level. This work investigates the Co(*d*)-Al(*p*) hybridization effects in the alloy films of ordered and disordered Co alumindes using the Co $L_{3,2}$ and *K*-edges and Al K-edges XANES spectra.

The Co_xAl_{1-x} alloys were prepared by melting Co and Al pieces of 99.99% purity in an arc furnace with a water cooled copper hearth, respectively. In order to obtain the volume homogeneity the ingot was remelted twice and then annealed at 1000 K for 6h. For thin film preparation the homogeneous Co-Al alloy ingot was crushed into powders 80-100 ㎛ in diameter. The Co-Al alloy films, with a total thickness of 150 ㎚, were prepared by means of the flash evaporation technique onto glass substrates in a high vacuum of 5×10^{-5} Pa. An equilibrium ordered in the TM-Al alloy films were obtained by their deposition onto heated substrates up to 680 K and the disordered states were obtained by vapor quenching deposition onto cooled substrates using liquid nitrogen.

The XANES measurements were performed at the 8A U7 undulator beam line in the Pohang Light Source (PLS) in Korea. The spectra of the Co $L_{3,2}$ edge and Al *K*-edge XANES were measured using the sample drain current mode at the room temperature. By the XANES results, the unoccupied *d* states of Co decrease with increasing of the Al concentration in Co_xAl_{1-x} alloy films, in addition, Co(d)-Al(p) hybridization is enhanced upon alloying. Al loses some *p*-orbital charge upon alloying. Finally, we found a charge transfer from the Al *3p* orbitals to Co sites.

[참고문헌]

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