MCD Spectrum at Mn $L_{2,3}$-Edges in Ferromagnetic Mn Compounds

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Ferromagnetic ordering is found in some Mn intermetallic compounds, though Mn metal is antiferromagnet. Electronic structure of Mn atoms in such a ferromagnetic state is an interesting subject in magnetism. Thus we have previously measured X-ray magnetic circular dichroism (XMCD) at Mn K-edge in various Mn-based ferromagnets, *e.g.*, Cu_2MnAl, Mn_3ZnC, etc., and found that the XMCD showed a large and complicated structure and a spectral change with temperature was observed in Mn_3ZnC. To compare the electronic property between 3*d*- and 4*p*-electrons, magnetic circular dichroism (MCD) at the Mn L-edge has been recorded.

The sample used in this work was polycrystalline slab of Cu_2MnIn, and Cu_2MnSn Heusler alloys, and Mn_3ZnC Perovskite. XAS was measured by the electron yield method and MCD was recorded in magnetic field reversing mode. The magnetic field of 1.4T was applied. Sample surface was polished by a diamond file in the vacuum chamber.

Figure 1 shows the XAS and MCD spectra at the Mn $L_{2,3}$-edges in Heusler alloys. These indicate that the 3*d*-states are metallic and have no significant difference except for the polarization intensity between the Cu_2MnIn and Cu_2MnSn compounds.

The XAS and MCD spectra for Mn_3ZnC in ferromagnetic phase at 300K and ferrimagnetic phase at 100K are shown in Fig.2. It should be noted that the 3*d*-states are regarded as rather atomic, because these spectra have a multiplet structure. In particular, satellite peaks are clearly observed in the higher energy side at the L_3-edge and show a temperature variation. Energy position of the peaks of MCD differs from that of XAS spectrum. These findings are probably associated with the magnetic phase transition accompanied with canting Mn moments. The change in MCD spectrum is, however, smaller than what is expected from the K-edge XMCD, hence the conduction electrons may play an important role in the phase transition.

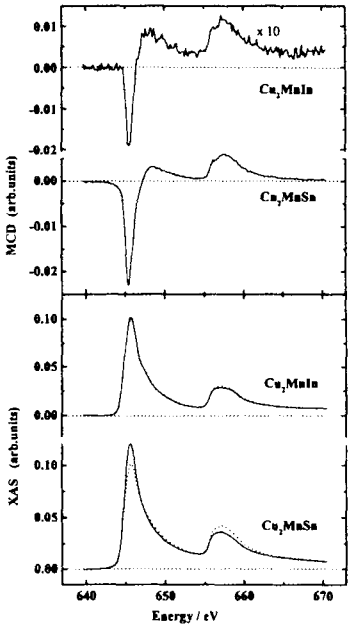

Fig.1. XAS and MCD spectra at the Mn $L_{2,3}$-edges in Heusler alloys.

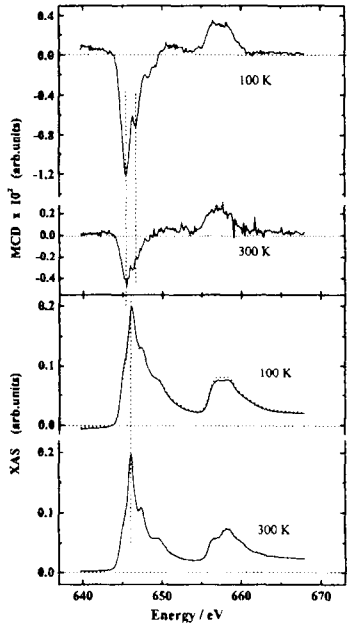

Fig.2. XAS and MCD spectra at the Mn $L_{2,3}$-edges in Mn_3ZnC compound.