

SX-RIXS under magnetic field for half-metallic ferromagnets in Heusler alloys

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Soft x-ray resonant inelastic x-ray scattering (SX-RIXS) will give us selected information connected directly with a specific intermediate state to which the incident photon energy is tuned [1]. Additionally, SX-RIXS is bulk-sensitive and not affected by any external perturbation such as magnetic field, therefore, it is thought to be powerful tool to prove the spin-polarized electronic structures for the half-metallic ferromagnets. Recently, we performed the SX-RIXS experiments under magnetic field for bulk single crystals in some Heusler alloys [2,3].

Single crystals of Mn_2VAl , Co_2MnSi , and Co_2FeSi Heusler alloys were made by Bridgeman method with the size of 12 mm diameter and about 25 mm length. SX-RIXS was measured at room temperature at the ultra-high resolution soft x-ray emission spectroscopy station (HORNET) at the end of the long undulator beam line BL07LSU of SPring-8, Japan.

Figure (a) indicates RIXS-MCD spectra for Mn L_3 -edge for Mn_2VAl at incident photon energy of 638.6 eV. Large signal of the MCD is observed and double peak feature split by 1.0 ~ 1.2 eV is also confirmed beside the elastic peak. Figure (b) shows calculated spectra for the MCD in each component from the m_j states (+3/2, +1/2, -1/2, and -3/2). Summation of these components would correspond to the experimental MCD. It is said that the signal of the MCD is mainly governed by the component from $m_j = -3/2$ state and the double peak feature is well reproduced by the calculated spectra.

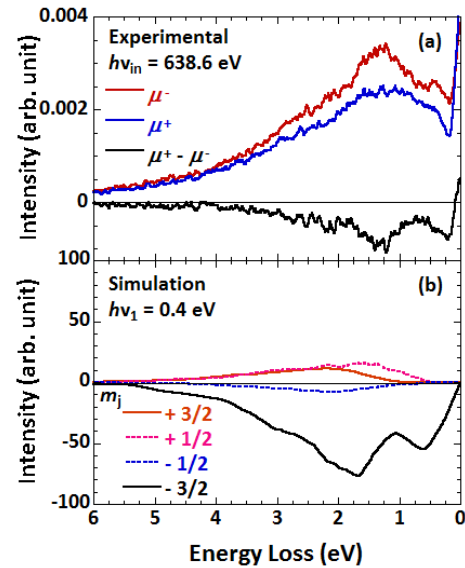


Fig. (a) Experimental RIXS-MCD spectra at 638.6 eV for Mn- L_3 . (b) Calculated RIXS-MCD [3].

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- [2] K. Nagai *et al.*, Phys. Rev. B **97**, 035143 (2018)
- [3] R.Y. Umetsu *et al.*, Phys. Rev. B **99**, 134414 (2019)