

Observation of spontaneous x-ray magnetic circular dichroism in the antiferromagnetic Mn_3Sn thin film

東大物性研¹, 東大理物², KEK 物工研³, 東大 TQSI⁴, JHU⁵

○坂本祥哉¹, 肥後友也², 志賀雅亘¹, 雨宮健太³, 中辻知^{1,2,4,5}, 三輪真嗣^{1,4}

ISSP, Univ. Tokyo¹, Dept. of Phys., Univ. Tokyo², IMSS, KEK³, TQSI, Univ. Tokyo⁴, JHU⁵

○Shoya Sakamoto¹, Tomoya Higo², Masanobu Shiga¹, Kenta Amemiya³,

Satoru Nakatsuji^{1,2,4,5}, Shinji Miwa^{1,4}

E-mail: shoya.sakamoto@issp.u-tokyo.ac.jp

X-ray magnetic circular dichroism (XMCD) is usually inapplicable to antiferromagnets in the absence of external magnetic fields. However, it was recently proposed that the inverse triangular spin structure (or the ferroic order of cluster magnetic octupole) of a noncollinear antiferromagnet can induce finite XMCD signals [1-3]. To test this proposal, we performed XMCD measurements on an epitaxial Mn_3Sn (1-100) thin film prepared by molecular beam epitaxy ([4], Fig. 1(a)).

Figure 1(b) shows the observed XMCD spectra at the Mn $L_{2,3}$ absorption edges. We observed finite XMCD signals even when magnetic fields were sufficiently weak (0.1 T). Because the spectral line shape is distinct from that taken with stronger magnetic fields (5 T), we conclude that the XMCD spectra taken with 0.1 and 5 T predominantly reflect the inverse triangular spin structure and spin canting, respectively.

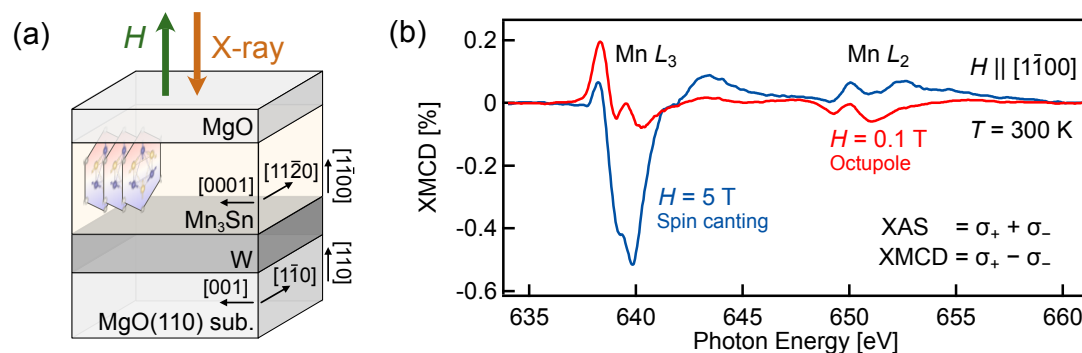


Fig. 1 (a) Schematic sample structure. (b) XMCD spectra taken under magnetic fields of 0.1 and 5 T.

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Reference

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