スパッタによる a-面配向の Mn_3Sn 薄膜

Highly a-plane-oriented Mn_3Sn thin films via sputtering deposition

アルバック未来研, 東北大

Future Technology Research Laboratory, ULVAC, Inc [1], Tohoku Univ. [2], ◦Seungjun Oh[1], Tadashi Morita[1], Tomoki Ikeda[2], Mikihiko Oogane[2], Masakiyo Tsunoda[2], Yasuo Ando[2]

E-mail: seungjun_oh@ulvac.com

Many of theoretical studies have indicated that a large anomalous Hall effect (AHE) could be also observed in antiferromagnet (AFM). As the first case in AFM, Mn_3Sn has been experimentally found to exhibit a large AHE [1]. The origin of AHE is not magnetization but significantly enhanced berry curvature which is from specific band structure in k-space. The enhanced berry curvature can play a similar role of magnetic field resulting Hall effects. For practical application, establishment of thin film deposition technique is necessary. Recently, it was reported that randomly oriented polycrystalline Mn_3Sn films showed a large AHE at room temperature [2]. Given that the direction of Berry curvature is parallel to (0001) c-plane of hexagonal Mn_3Sn crystal, (11-20) a- or (1-100) m-oriented films are desirable to apply for Hall bar measurement.

In this study, highly a-oriented Mn_3Sn thin films were grown on m-plane sapphire substrates with low-temperature grown Mn_3Sn buffer layers by sputtering deposition technique, and their crystallinity and magnetic properties were investigated by X-ray diffraction and SQUID magnetometer, respectively. Fig.1 shows XRD pattern of highly a-oriented Mn_3Sn film. The crystallographic orientations of Mn_3Sn domains are found to be sensitively influenced by substrate temperature, thickness and composition ratio of $Mn_{3+\alpha}Sn$ buffer layer.

This work was supported in part by Center for Spintronics Research Network, Tohoku University (CSRN).

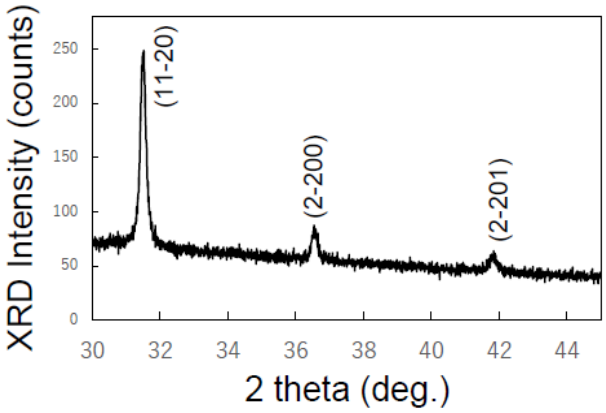

Figure 1. XRD pattern of highly a-oriented Mn_3Sn film.

References [1] S. Nakatsuji et al., NATURE, **527**, 212 (2015)., [2] T. Ikeda et al., Appl. Phys. Lett. **113**, 222405 (2018).