反強磁性 Mn_3Ir におけるスピンホール効果

Spin Hall effect in antiferromagnetic Mn_3Ir

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Spin Hall effect (SHE) is a convenient phenomenon which converts electric currents into spin currents. SHE is considered an effective spin current source and is often used in combination with magnetic materials to manipulate their spins. Recently, it has been shown that SHE in chiral antiferromagnet DO_{19}-Mn_3Sn has different characteristics from that in typical non-magnetic spin Hall materials [1], such as Pt and Ta, which originates from the chiral magnetic structure in conjunction with the non-zero anomalous Hall effect [2]. In this work, we fabricated antiferromagnetic $L1_2$-Mn_3Ir thin films having a chiral magnetic structure and investigated the spin transport properties as well as the spin Hall effect.

Multilayers of Mn_3Ir 30nm/Ti 1nm/Py 5nm/SiO_2 5nm were deposited on a MgO (001) substrate by magnetron sputtering with various substrate temperatures T_s. Crystal ordering and orientation of the Mn_3Ir were characterized by X-ray diffraction (XRD). As shown in Fig. 1 (a), the (001) and (003) superlattice peaks evidence that the $L1_2$-ordered Mn_3Ir is formed at $T_s \geq 700$℃. These $L1_2$-Mn_3Ir showed anomalous Hall conductivity as much as 40 $\Omega^{-1}cm^{-1}$ [3]. The spin Hall effect was characterized by the spin torque ferromagnetic resonance (ST-FMR) measurement. In the presentation, we will report the comparisons of the spin Hall angles for the disordered Mn_3Ir and $L1_2$-Mn_3Ir, and their correlation to the anomalous Hall conductivities.

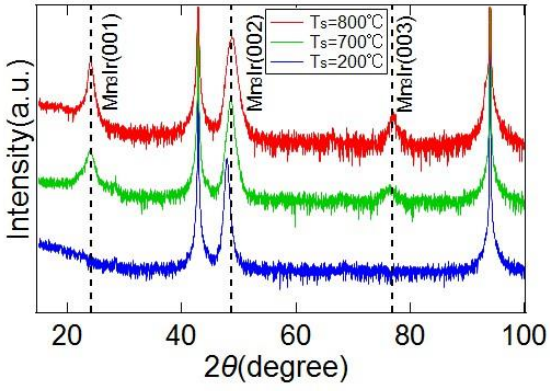

Fig. 1 The XRD pattern for MgO(001)/Mn_3Ir/Ti/Py/SiO_2 films

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