Novel spin to charge interconversion phenomena in a chiral antiferromagnet

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Spin Hall effects (SHEs) are a collection of relativistic spin-orbit coupling phenomena in which electrical currents can generate transverse spin currents and vice versa. Despite being observed only a decade ago, these effects are already used in spintronics as standard spin-current generators and detectors.

Recently a chiral antiferromagnet Mn_3Sn has been demonstrated to exhibit a large anomalous Hall effect (AHE) at room temperature, the magnitude of which reaches almost the same order of magnitude as in ferromagnetic metals irrespective of a tiny spontaneous magnetization of about 1 mT [1]. The first principle calculation revealed that this large AHE originates from a significantly enhanced Berry curvature associated with the formation of Weyl points near Fermi energy [2,3]. The AHE, as is well known, shares its mechanism with the spin Hall effect. The large AHE therefore implies that a large SHE could take place in the Mn_3Sn.

In this talk we show experimental results of two complementary experiments such as detection of spin accumulation induced by the direct SHE and spin pumping induced inverse SHE in Mn_3Sn. Our experimental results demonstrate that we could observe the spin accumulation associated with the direct DHE and also the signals due to the inverse SHE.

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