MANIPULATION OF SPIN CURRENT AND SPIN HALL EFFECTS IN METALLIC SYSTEMS

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Establishing technique for efficient generation and manipulation of spin currents is a key for further advancement of spintronic devices. There is a novel phenomenon where the spin-orbit interaction converts a charge current into a spin current and vice versa. These are known as the direct and inverse spin Hall effects (SHEs). Recently, we have reported a clear observation of a direct and inverse spin Hall effects at room temperature (RT) induced in a platinum wire, which exhibits a strong spin-orbit interaction.[1] The value of SH conductivity of the Pt wire is evaluated to be 2.4×10^4 (S/m) at RT 10^4 times larger than the values reported for semiconductor systems. This result opens up a new possibility to use normal metals with high spin-orbit coupling as spin current sources operating at room temperature for future spintronic applications. In the presentation, we will explain the mechanism of the electrical detection technique of the SHE. We will also report the temperature and geometrical evolutions of the SHE in the Pt wires and will discuss the origin of the SHE.[2] The SHE in other metallic systems will be reported.

[1] T. Kimura, Y. Otani et al., Phys. Rev. Lett. 98, 156601 (2007)
[2] L. Vila, T. Kimura, and Y. Otani, Phys. Rev. Lett. 99, 226604 (2007)