

Spin Seebeck Effect in a Variety of Magnetic Systems

Sadamichi Maekawa¹

M. Ricardo Ibarra² and Eiji Saitoh³

¹Advanced Science Research Center, Japan Atomic Energy Agency, Japan

²Instituto de Nanociencia de Aragon, Universidad de Zaragoza, Spain

³WPI Advanced Institute for Materials Research, Tohoku University, Japan

maekawa.sadamichi@jaea.go.jp

When metals and semiconductors are placed in a temperature gradient, the electric voltage is generated. This mechanism to convert heat into electricity, the so-called Seebeck effect, has attracted much attention as the mechanism for utilizing wasted heat energy [1].

Ferromagnetic insulators are good conductors of spin current, i.e., the flow of electron spins [2]. When they are placed in a temperature gradient, generated are spin current and the spin voltage [3], i.e., spin accumulation. Once the spin voltage is converted into the electric voltage by the inverse spin Hall effect in attached metal films, the electric voltage is obtained from heat energy [4-6]. This is called the spin Seebeck effect (SSE).

Here, we present our recent progress in the study on the spin Seebeck effect in collaboration with the Zaragoza team headed by M. R. Ibarra [7].

References

- [1] S. Maekawa et al., Physics of Transition Metal Oxides (Springer, 2004).
- [2] S. Maekawa et al.: Spin Current (Oxford University Press, 2012).
- [3] Concept in Spin Electronics, eds. S. Maekawa (Oxford University Press, 2006).
- [4] K. Uchida et al., Nature 455 (2008) 778.
- [5] K. Uchida et al., Nature Materials 9 (2010) 894.
- [6] H. Adachi et al., Rept. Prog. Phys. 76 (2013) 636501.
- [7] R. Ramos et al., Appl. Phys. Lett. 102 (2013) 072413.

Figure

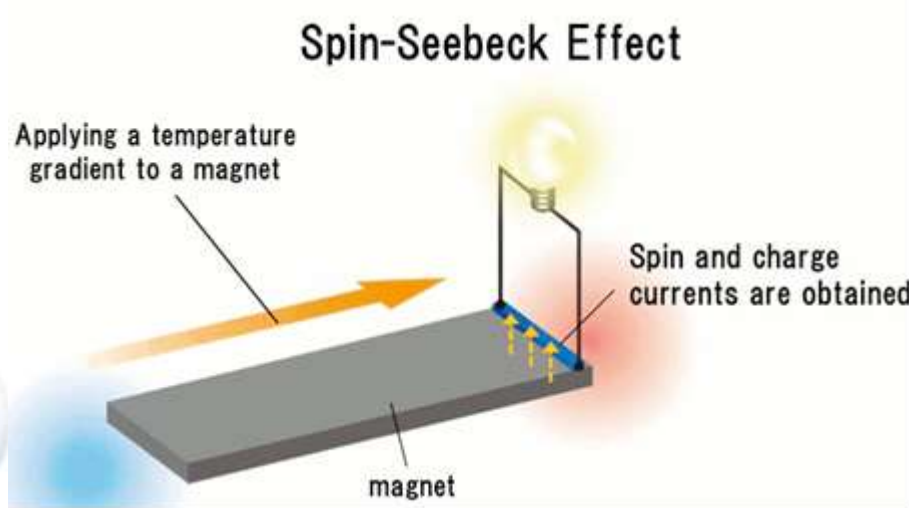


Figure 1. Schematic illustration of the spin Seebeck effect