Thermoelectric effect in YIG/Co-Ru/Pt systems

[1]Kyushu Univ., [2]ClC nanoGUNE BRTA
○(B)Y. Ikeda[1], T. Yamauchi[1], Y. Hamada[1], Y. Kurokawa[1],
C. M. Valderrama[2], A. Berger[2], H. Yuasa[1]
E-mail: ikeda@mag.ed.kyushu-u.ac.jp

The spin manipulation and enhancement are important for spin current application. We have previously reported that spin Seebeck voltage and SMR were improved by inserting 0.3-0.6 nm magnetic layers in the YIG/Pt system, where magnetic layer has no magnetization due to small thickness[1]. However, if there is magnetic component in the inserted layers, it is difficult to separate the spin Seebeck effect and anomalous Nernst effect. Compared to this, the magnetic state was successfully changed by composition modulation of Co-Ru with the same thickness[2]. In this study, we systematically investigate the thermoelectric force in the YIG 50nm /$Co_{100-x}Ru_x$ 2nm /Pt 5nm.

All layers were deposited on thermally oxidized Si wafer by magnetron sputtering. We varied the composition as $x = 0, 5, 10, 15, 20, \text{and } 25$. In each sample, we applied a temperature gradient from the top and bottom sides, and derived the spin Seebeck coefficient from the total thermoelectromotive force as shown in Fig. 1.

Figure 2 shows the composition dependences of the magnetization of Co-Ru estimated from Kerr effect ellipsometry analysis, the spin Seebeck and anomalous Nernst coefficients, S and N, separated from total thermoelectric voltage as shown in Fig. 1. The S increase and N decreases as following the magnetism reduction, corresponding to the magnetization existence.

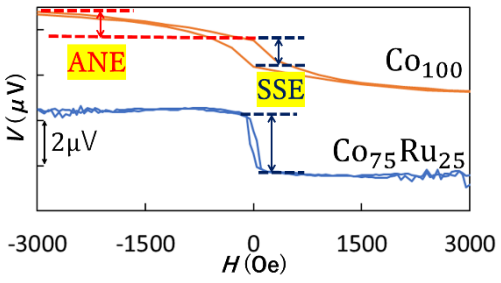

Fig. 1 Thermoelectric voltages based on SSE and ANE

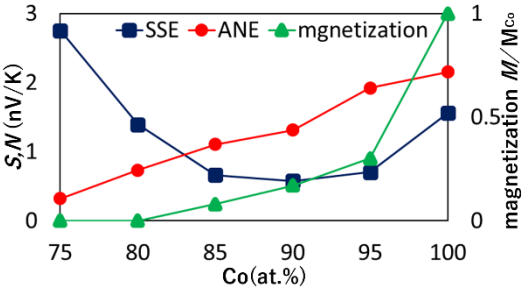

Fig. 2 Magnetization, SSE, and ANE coefficients dependence on Co-Ru composition

[1] T. Niimura, *et al.* Phys. Rev. B 102, 094411 (2020)
[2] C. M. Valderrama *et al.* J. Phys. D: Appl. Phys. 54 435002 (2021)