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Anomalous Nernst and Hall effects in Mn-Ga-Co epitaxial thin films

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Recently, a new research field dealing with a relationship between spin current and heat current, so-called “Spin caloritronics” is attracted, and studies on anomalous Nernst effect (ANE) in the view point of spin caloritronics are active. ANE is a thermomagnetic effect which generates electric field and expected to be applied to thermoelectric devices, thus the discovery of materials that reveal large ANE is needed. On the other hand, anomalous Hall effect (AHE) is a similar phenomenon to ANE. To compare AHE with ANE is important to understand the mechanism of ANE, and it would bring a direction of exploring materials that reveal large ANE.

In this study, we focused on Co-substituted Mn-Ga alloy (MnGaCo). It is reported that the crystal structure of MnGaCo transits from tetragonal to cubic with increasing Co composition [1]. At the same time, the easy magnetization axis of MnGaCo thin film changes from out of plane to in-plane with the Co composition, accompanying the change of magnetic anisotropy energy [2]. We investigated ANE and AHE in MnGaCo thin films in detail.

Samples are fabricated by a magnetron sputtering. A MnGa alloy target and a Co target are used to deposit MnGaCo on MgO (001) substrate at 500˚C with various Co composition. XRD and SQUID are used to characterize crystallographic and magnetic properties of samples, respectively. ANE and AHE of samples are measured by a Physical Property Measurement System (PPMS).

Figure 1 shows temperature dependences of anomalous Nernst voltage in MnGaCo (Co = 9.5%). Distinct hysteresis loops of anomalous Nernst voltage were observed at 100 and 300 K. Details of the relation between ANE and AHE will be discussed on the presentation.

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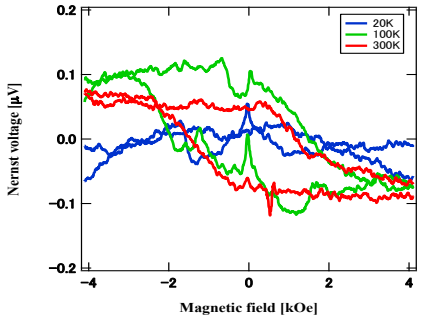

Figure 1. Temperature dependence of anomalous Nernst voltage in MnGaCo (Co = 9.5%).

References

[1] V. Alijani *et al.*, Appl. Phys. Lett, **99** (2011) 222510.

[2] T. Kubota *et al.*, J. Appl. Phys. **113** (2013) 17C723.