§79. Geometric Contribution to the Measurement of Nernst Coefficient and Thermoelectric Power in a Strong Magnetic Field

Ikeda, K. (Grad. Univ. Advanced Studies.), Nakamura, H., Yamaguchi, S.

We call some semiconductors Nernst element, which will be able to use for the generation of electric power by applying the Nernst effect [1,2]. As the fundamental study for the power generation by the Nernst elements, we are studying for the transport properties of its candidates in a magnetic field [3,4]. We will be able to estimate the efficiency of energy conversion by their transport coefficients.

On the measurement of Nernst coefficient and thermoelectric power, we used two kinds of shapes in Fig.1 for a sample and detected the discrepancies of measured values due to the differences of shapes. We call it geometric contribution to measurements.

![Fig.1](image)

Fig.1. (a) is "Bridge shape" and (b) is,we call, "Fat-Bridge shape".

Pure n-InSb are used as a sample, whose carrier concentration measured at 77K was $6.6 \times 10^{-14}$ cm$^3$. The temperature difference induced between the both edges of samples were about 10°C or 100°C near a room temperature range of 0 to 100°C. Magnetic induction applied in the perpendicular direction to temperature gradient was in the range of 0 up to 4 Tesla. Figure 2 shows that the "Fat-Bridge shape" indicated about 10% smaller Nernst coefficient and 1 to 10% smaller thermoelectric power than the "Bridge shape".

![Fig.2](image)

Fig.2 (a) indicates Nernst coefficient times B vs B, and (b) is thermoelectric power vs B.

When we confirm the transport coefficients by the measurement, the geometric contributions must be considered and excluded. This condition is similar to the measurement of the Hall effect [6,7]. And we shall need to develop the calculation code to interpret the transport properties including the geometric contributions.

References
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