Hall effect on metallic and charge-ordered states in θ-$(BEDT\text{-}TTF)_2CsZn(SCN)_4$

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The physics of nearly insulating metals is an intriguing issue. This is because the phenomena that violate the conventional Fermi-liquid theory are often observed in such an electronic state. Strong magnetic fluctuation is one of the anomalous physical properties of the unconventional metals. On the other hand, the metallic state with charge fluctuation is another topic in the nearly insulating metals. In particular, the details of transport properties of this electronic state have not been clarified yet. In this regard, we investigated the Hall effect on one of the organic systems that shows the charge fluctuation.

Figure 1 displays temperature dependence of resistivity, ρ, and Hall coefficient, R_H, of θ-$(BEDT\text{-}TTF)_2CsZn(SCN)_4$. The positive value of R_H at high temperatures suggests that the dominant carriers of this system are holes, which is consistent with the results of other physical properties[1]. With decreasing temperature, $R_H(T)$ maintains nearly flat temperature dependence before 60 K, which is the behavior of the conventional metals. At 60 K, $R_H(T)$ suddenly initiates to decrease and, at lower temperatures, R_H changes the sign. The simplest interpretation for this phenomenon is that the finite charge gap opens at this temperature and the electrons as dominant carriers start to contribute to $R_H(T)$.

The clear indication of the contribution of the charge fluctuation to R_H was not detected in the present work although the existence of the very slow charge-fluctuation had been reported [2]. Ac Hall effect may be an appropriate probe for this study. This is now under the way.

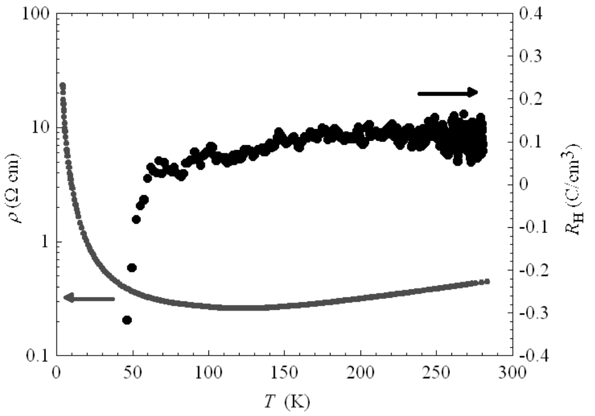

Fig. 1. Temperature dependence of resistivity, ρ, and Hall coefficient, R_H, of θ-$(BEDT\text{-}TTF)_2CsZn(SCN)_4$. As for the Hall effect, magnetic field of 1.5 T was applied perpendicular to the conducting plane.

[1] H. Mori *et al*., Phys. Rev. B**57,** 12027 (1998).
[2] R. Chiba *et al*., Phys. Rev. B**77**, 115113 (2008).