Electric Field and Magnetic Field Responses at Room Temperature in an Organic Conductor β-(BEDT-TTF)$_2$PF$_6$

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Recently electric field and magnetic field responses in charge-ordered molecular complexes have been extensively studied from a fundamental viewpoint related to nonlinear phenomena as well as potential applications such as switching and thyristor devices [1]. In order of clarify electronic states in electric and magnetic fields at room temperature, the nonlinear resistivity and magnetoresistance for β-(BEDT-TTF)$_2$PF$_6$ with T_{CO} (charge-ordered temperature) = 297K [2,3] was investigated.

The *J-E* characteristics driven by electric field with two-probe method were shown in Fig.1; nonlinear resistivity was observed at 295K, the negative differential resistivity (NDR) was revealed below 290K, and the giant nonlinear resistivity by three orders of magnitude was obtained at 265K (Fig.1). The time resolved resisitivity measurements in use of oscilloscope also demonstrate the NDR at 290K. In addition, the negative magnetoresistivity (MR) by -9% under 5T was observed at 296K around T_{CO}. The relatively large MR at room temperature might be caused by Zeeman effect to reduce the charge-ordered gap. These electric field and magnetic field responses of β-(BEDT-TTF)$_2$PF$_6$ are deeply related to the appearance of charge-ordering at 297K, around room temperature.

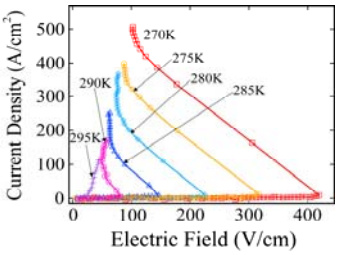

Fig.1 *J-E* characteristics of β-(BEDT-TTF)$_2$PF$_6$

[1] F.Sawano *et al.*, Nature 437 (2005) 522.
[2] Kobayashi *et al.*, Chem. Lett. (1983) 581.
[3] K. R. Senadeera *et al.*, J. Phys. Soc. Jpn. 67 (1998) 4913.