

Nonlinear Conductivity in DCNQI Derivatives and Voltage Oscillation in β'' -(BEDT-TTF)₃(HSO₄)₂

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Recently, nonlinear conductivity has been found in several organic conductors [1], and current oscillation called an organic thyristor has been reported [2]. We have observed nonlinear conductivity in Cu complexes of halogen-containing DCNQI (dicyanoquinonediimine), which undergo metal-insulator (M-I) transitions between 160 and 235 K. The results are satisfactorily simulated on the basis of the energy balance (Fig. 1) [3]. We have also observed nonlinear conductivity in (*d*₂-DMDCNQI)₂Cu, which shows a reentrant M-I transition [4]. In addition to the usual nonlinear conductivity from the insulating phase to the metallic phase, reentrant nonlinearity is observed starting from the low-temperature metallic state to the low-conducting state, followed by further return to the high-conducting state.

β'' -(BEDT-TTF)₃(HSO₄)₂ undergoes a steep M-I transition, and exhibits steep “transition type” nonlinearity. When a regulated current pulse is applied, rapid voltage oscillation is observed (Fig. 2), which resembles that observed in α -(BEDT-TTF)₂I₃. The frequency is several 10 kHz, and increases in proportion to the applied current.

[1] T. Mori *et al.*, J. Mater. Chem. 17 (2007) 4343. [2] F. Sawano *et al.*, Nature 437 (2005) 522. T. Mori *et al.*, Phys. Rev. Lett. 100 (2008) 037001. [3] T. Mori *et al.*, Phys. Rev. B 79 (2009). [4] R. Kato, Bull. Chem. Soc. Jpn. 73 (2000) 515.

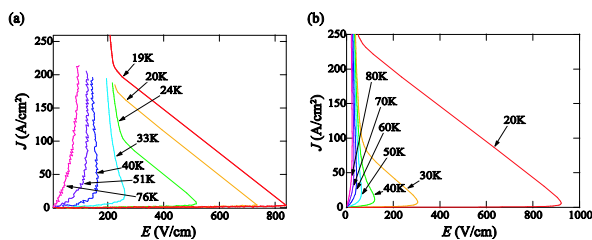


Fig. 1 (a) Nonlinear characteristics of (MeBrDCNQI)₂Cu observed by 2-probe measurement, and (b) the simulation.

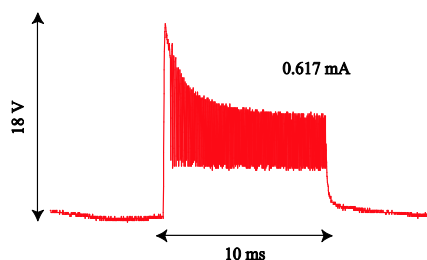


Fig. 2 Voltage oscillation in β'' -(BEDT-TTF)₃(HSO₄)₂.