Peculiar Electric-Field-Induced Metastable State of Charge-Ordered Molecular Conductor *β*-(*meso*-DMBEDT-TTF)$_2$PF$_6$

Shoichi Niizeki [1], Tomonori Asano[1], Kazuyuki Takahashi[1], Hatsumi Mori [1],
Hiroyuki Matsuzaki [2], Hiroshi Okamoto[2], and Yutaka Nishio[3]
[1] *Institute for Solid State Physics, University of Tokyo, Japan*
[2] *Department of Advanced Materials Science, University of Tokyo, Japan*
[3] *Department of Physics, Toho University, Japan*
Email: hmori@issp.u-tokyo.ac.jp

Recently non-linear conductivity of charge-ordered molecular conductors has attracted much attention because of appearance of giant nonlinear conduction with low activation voltage, thyristor-like oscillation [1], and electric-field (EF) -induced metastable state [2]. In order to clarify the metastable state, the simulation of time resolved V_{sample} under EF assumed for the self-heating and the observation of raman spectroscopy of checkerboard-type charge-ordered molecular conductor *β*-(*meso*-DMBEDT-TTF)$_2$PF$_6$ were carried out. The comparison between experimental and calculated results indicates that the EF responses under $V_{circuit}$ = 3 V such as resistance drop and metastable state are a non-thermal but an intrinsic EF effect (Fig.1). Moreover, the metastable state observed by the synchronized raman spectra suggests non-coexistence of charge-ordered insulating and metallic states, but a homogeneous fluctuated charge-ordered state. In the electric-field-induced metastable state with 100 < R < 1000 ohm, the confined charges by the Coulomb interaction are averaged and the melting of superlattice might be delayed.

[1] F. Sawano *et al.*, Nature 437 (2005) 522.
[2] S. Niizeki *et al.*, J. Phys. Soc. Jpn. 77 (2008) 073710.

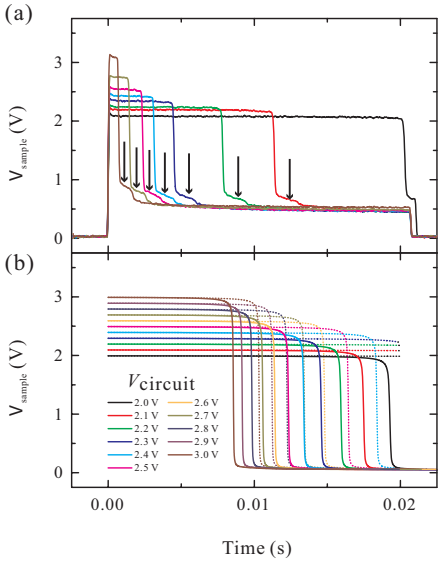

Fig. 1 (a) Experimental and (b) calculated results of time-dependent V_{sample} under $V_{circuit}$ (= 2 – 3 V) at 60 K for *β*-(*meso*-DMBEDT-TTF)$_2$PF$_6$. (b) The arrows indicate the field-induced metastable states and (b) the self-heating simulation is carried out without (solid line) and with (dotted line) radiation through gold wire.