

# Reponses by External Stimuli and their Structures for Charge-ordered Molecular Crystals

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Recently, in the field of molecular conductors, the researches related to *charge ordering* (CO) where long range Coulomb interactions play important roles have been intensively carried out theoretically [1] and experimentally [2]. These inter-cite Coulomb interactions are competitive with overlaps of molecular orbitals proportional to bandwidth, namely the highly electron-correlated state.

We aim for novel electronic states of molecular charge-ordered crystals by applying external stimuli such as magnetic field, electric field, pressure, light, *etc.* by utilizing the molecular degree of freedom. Especially, non-equilibrium state can be realized by applying electric field and light. In this presentation, the response of external stimuli such as pressure [3] and electric field [4] for the charge-ordered molecular crystal,  $\beta$ -(*meso*-DMBEDT-TTF)<sub>2</sub>PF<sub>6</sub>.

The metal-insulator (MI) transition occurs at 90 K with accompanying the formation of checkerboard-type CO determined at PF-BL1A [Fig. (a)]. By applying pressure, the electronic phase diagram was obtained, where the superconducting state is neighboring to the long- and short-range charge-ordered states [Fig. (b)].

By applying electric field, after the giant drop of resistivity and electric field-induced metastable state have been obtained, suggesting the homogeneous charge-fluctuated state [Fig. (c)]. The structure of the peculiar field-induced metastable state should be observed.

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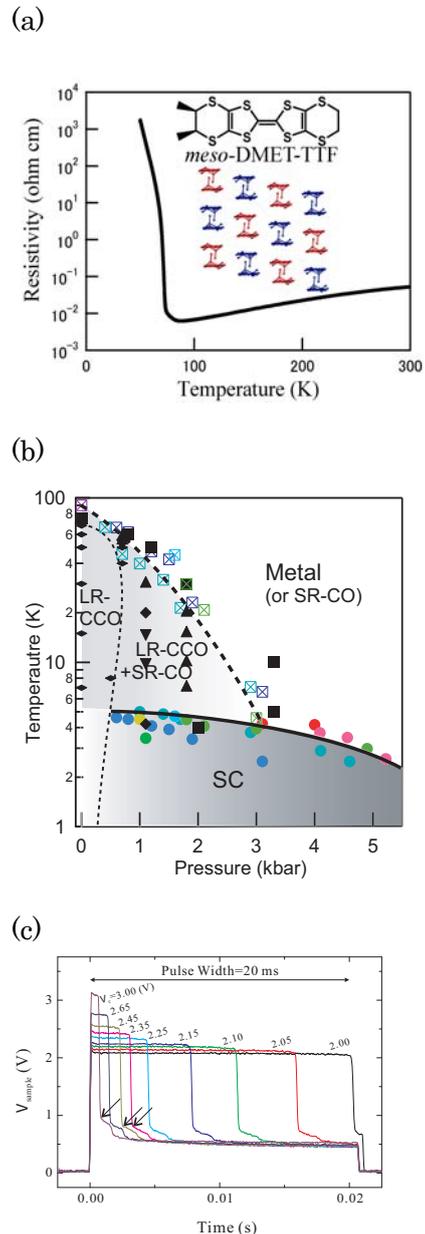


Fig. (a) Molecular structure and the metal-insulator transition by the formation of checkerboard (CB)-type charge ordering (CO), (b) the electronic phase diagram, where the superconducting state is next to the long-range and short-range CO, and (c) electric field induced metastable state for molecular crystal,  $\beta$ -(*meso*-DMBEDT-TTF)<sub>2</sub>PF<sub>6</sub>.