# Charge disproportionation in organic conductors

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The electronic state of two dimensional organic conductors α-(BEDT-TTF)$_2$X was studied by scanning tunneling microscopy (STM). The conducting plane of single crystals was investigated at room temperature.

Figure 1 shows STM current image of α-(BEDT-TTF)$_2$I$_3$, which undergoes the charge ordering state below $T_{CO}$=135 K due to the long range Coulomb interaction. BEDT-TTF donor molecules were clearly imaged as bright spots. The obtained donor arrangement is characterized as α-type arrangement, in which there are two donor stacks in the unit cell. We found that the brightness of spots varies alternatively along the *a*-axis. Such a modulation cannot be expected from the crystal structure. It suggests the charge disproportionation which forms charge stripe structure even above $T_{CO}$ [1].

We also investigated other materials with similar donor arrangement. Figure 2 shows current image of α-(BEDT-TTF)$_2$KHg(SCN)$_4$ (K-salt) at room temperature. The material undergoes the density wave state below $T_{DW}$=8 K. The donor arrangement is also recognized clearly as α-type. We found charge stripe modulation even in this salt, which does not undergoes the charge ordering state. Furthermore, we studied α-(BEDT-TTF)$_2$RbHg(SCN)$_4$ (Rb-salt). The salt is isomorphic with K-salt and its ground state is the density wave state with $T_{DW}$=12 K. The charge stripe structure was also found in Rb-salt.

The charge stripe structure was found in three different salts with the same donor arrangement at much higher temperature than their transition temperature. We think that the charge disproportionation at room temperature is common feature in α-(BEDT-TTF)$_2$X.

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**References**

[1] K. Katono, T. Taniguchi, K. Ichimura, Y. Kawashima, S. Tanda and K. Yamamoto, *Phys. Rev. B*, **91**, 125110 (2015).

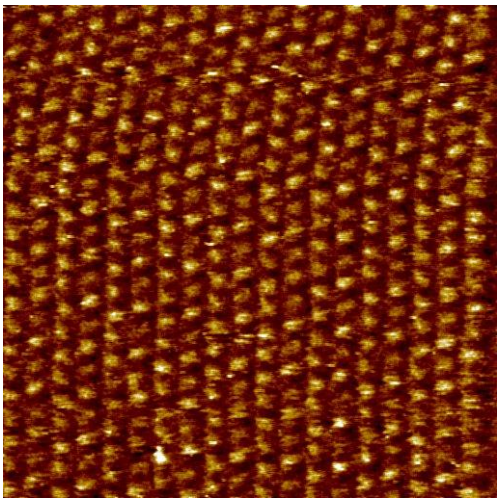

Fig. 1. STM image of the conducting plane of α-(BEDT-TTF)$_2$I$_3$ at 290 K. Scan area is 9.4×9.4 nm$^2$.

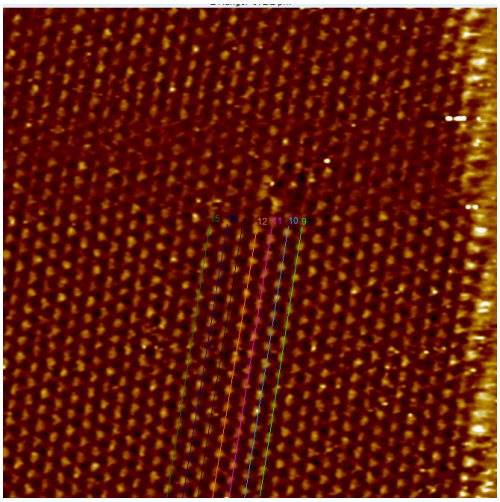

Fig. 2. STM image of the conducting plane of α-(BEDT-TTF)$_2$KHg(SCN)$_4$ at 290 K. Scan area is 15×15 nm$^2$.