Structural study of α- and θ-type organic conductors under uniaxial strain

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Structural studies of α- and θ-type organic conductors, which have a herringbone molecular arrangement in the 2D conducting plane, are performed under uniaxial strain.

α- and θ-type organic conductors have shown various electronic phases such as superconducting phase, metallic one and charge ordered (CO) insulating one. We have found out a hump-like resistance anomaly in the region between the metallic and CO insulating phases in θ-(BEDT-TTF)$_2$CsZn(SCN)$_4$ (θ-CsZn) employing uniaxial strain method. Such anomaly was also observed in the vicinity of the insulating phases of θ-(BEDO-TTF)$_2$Cl·xH$_2$O under hydrostatic pressure and α-(BEDT-TTF)$_2$CsCd(SCN)$_4$ (α-CsCd) under uniaxial strain, indicating the possibility that this is an intrinsic electronic phase to the organic conductors having the herringbone molecular arrangement. The purpose of the study is to investigate structural changes accompanied by the resistance anomaly.

Figure 1 shows the temperature dependence of the resistivity of θ-CsZn under various c-axial strain. Under 5 kbar, the hump-like anomaly is observed around 200K. We observe super-lattices whose wave number is (1/3, 0, 1/4) below the temperature. (Fig. 2) A structural fluctuation having the same wave number was observed in the high-temperature region of the isostructural θ-(BEDT-TTF)$_2$RbZn(SCN)$_4$, which has a metal-insulator transition accompanied by a charge ordered transition below 190 K.
On the other hand, super-lattices whose wave number are (1/3, 0, 1/3) and (1/4, 0, 1/4) are observed in α-CsCd accompanied by the hump-like anomaly.

In this presentation, we report the structural and electronic properties of θ-(BEDT-TTF)$_2$CsZn(SCN)$_4$ and α-(BEDT-TTF)$_2$CsCd(SCN)$_4$ under uniaxial strain.

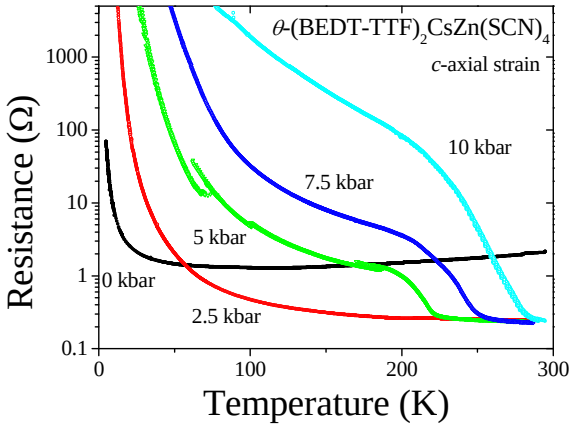

Figure 1: Temperature dependence of resistance of θ-CsZn under various c-axial strain.

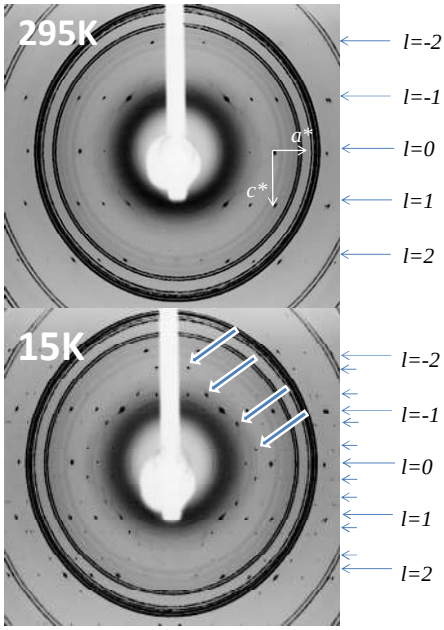

Figure 2: Observed super-lattice accompanied by the hump-like anomaly.