

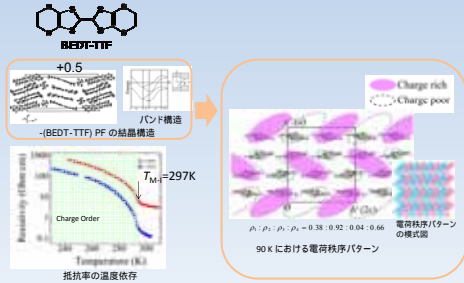


分子性結晶における構造物性研究 - 外場下における物性と構造 - Structural studies of molecular crystals under extreme conditions

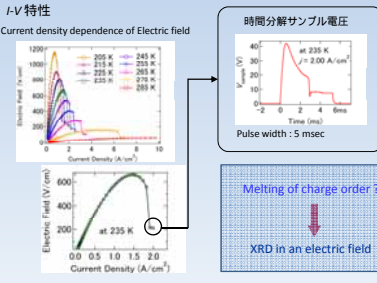
中尾朗子・CROSS・CMRC

β-(BEDT-TTF)2PF6における電場下の時分割回折実験 共同研究者 東大物性研・森初果, 市川敦, 磯野貴之

-(BEDT-TTF)2PF6の電荷秩序



-(BEDT-TTF)2PF6の電場応答



Experimental

研究の目的

- 低抵抗状態は電荷融解? Filamentary phenomenon or Bulk phenomenon? Heat effect or Thermal breakdown? 低抵抗状態の構造を明らかにする。分子構造は? chargeは?

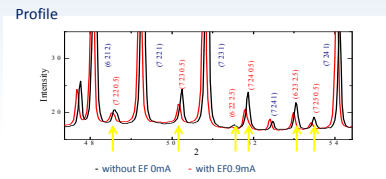
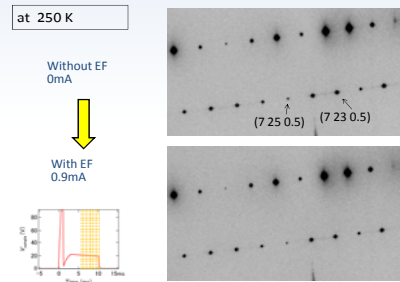
実験

PF-BL-8A IP + He 吹付 250Kで、電場印加して振動写真



X線回折実験@BL-8A

Results



The intensities of superlattice reflections decreased by an average of 25%.

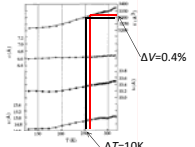
Cell constants

Table with 2 columns: Without EF 0mA and With EF 0.9mA, listing cell constants a, b, c, V and their percentage changes.

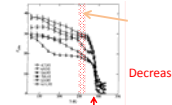
The volume of unit cell increase by 0.43%.

Discussion

Temperature dependence of lattice constants

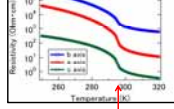


Temperature dependence of superlattice reflections



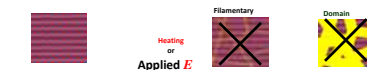
Decrease of 25%.

Resistivity



Heat effect

Equation for heat effect: ΔT = (V \* N \* Q) / (C \* m) = 11.16 K. Also lists ΔV=0.4% and ΔT=10K.



電荷秩序状態

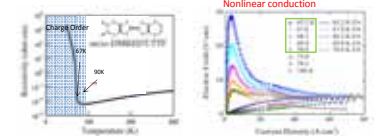
0.38 0.92 0.04 0.66

charge rich charge poor disorder

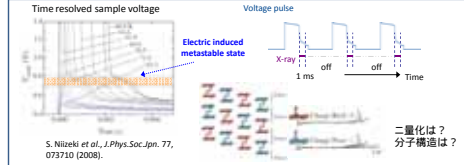
結晶全体で、電荷秩序のコントラストが弱まっている

Future plane

β-(meso-DMBEDT-TTF)2PF6



The long-range checkerboard-type charge ordering below 70 K



S. Nizeki et al., J.Phys.Soc.Jpn. 77, 07310 (2008).

二重化は? 分子構造は?

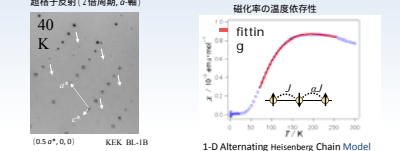
β''-(DODHT)2X; X(対アニオン)の構造解析 共同研究者 茨城大・西川浩之, 岡山大・近藤隆祐, 野上由夫

圧力誘起超伝導体 β''-(DODHT)2PF6: 電荷秩序 (CO) 絶縁相

β''-(DODHT)2AsF6の放射光による構造解析



均一な電荷分布(平均電荷状態 +0.5値) 層格子反射(2倍周期, a軸) 電荷秩序状態(+1 and 0値) 磁化率の温度依存性



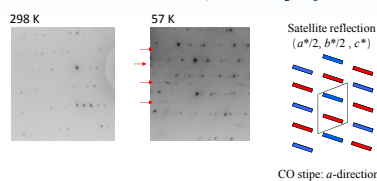
研究の目的

β''-(DODHT)の対アニオンによる物性の違いを明らかにする(対アニオンのサイズ依存性?)

β''-(DODHT)2AsF6の常圧の絶縁相を明らかにする。

- PF塩と同様、COか? COのパターンは?

Satellite reflections of β''-(DODHT)2AsF6



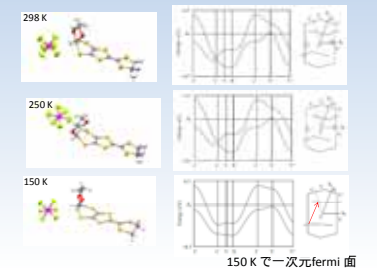
Satellite reflection (a\*/2, b\*/2, c\*)

CO stripe: a-direction

Satellite peaks = broad

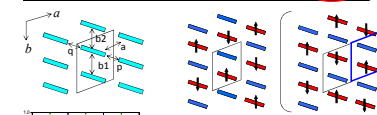
250 Kと150 Kで構造解析

Band structures and Fermi surfaces of β''-(DODHT)2AsF6



Intermolecular interaction in β''-(DODHT)2AsF6

Table of overlap integrals (in units of 10^-3 eV) for different directions at 298 K, 250 K, and 150 K.



qの値が150 K以下で小さくなったため、一次元Fermi面への変化し、p-q方向に電荷が整列できない|V|が大きい

90 K以下で電荷がorderすると同時にネスタングがおこり非磁性に転移

β''-(DODHT)2X; X(対アニオン)の物性

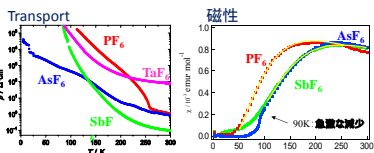


Table summarizing the properties of different β''-(DODHT)2X salts, including anion, charge order, and conductivity.