Competition of Two Charge Ordering Domains in θ-(BEDT-TTF)$_2$RbZn(SCN)$_4$

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In the organic 2D system, the charge frustration and the charge ordering(CO) in quasi-triangular lattice are important problems. Concerning these problems, θ-(BEDT-TTF)$_2$Cs(Zn or Co)(SCN)$_4$ is focused materials owing to their giant non-linear conductivity[1] and melting of two-fold horizontal CO($\boldsymbol{q}_2$) only by current[2];there are two CO's in these materials. These behaviors are not due to simple self-heating by Joule effect but to inherent current effect [3]. To deepen our understanding, we are looking for another material exhibiting similar interesting behavior induced by current.

Recently we noticed to be able to freeze 3×4 short ranged CO($\boldsymbol{q}_1$), and realize lower resistive state by suppressing $\boldsymbol{q}_2$ CO in θ-(BEDT-TTF)$_2$RbZn(SCN)$_4$ with ultra rapid cooling. Around 140 K a monotonic decrease in diffuse scattering intensity of the $\boldsymbol{q}_1$, modulation and a monotonic increase in the $\boldsymbol{q}_2$ intensity was observed with a passage of time. Furthermore the resistivity corresponds well to the size of the $\boldsymbol{q}_2$ domain. These results show the $\boldsymbol{q}_1$, domain is metallic (or lower resistive) and the $\boldsymbol{q}_2$ domain is insulating. The competing CO's clearly observed in the title material will be a key to understand the non-linear electronic property in these compounds at low temperatures.

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