Phase Diagram of the Field-Induced Spin-Density-Wave State in $(TMTSF)_2ClO_4$ deduced from the Specific Heat Measurements

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In some quasi-one dimensional organic conductors, it is well known that a field-induced spin-density wave (FISDW) state is stabilized in a magnetic field perpendicular to the conducting layers. Most features of the FISDW state are basically understood in terms of so-called "standard model". However, some qualitative disagreements with the model were reported in $(TMTSF)_2ClO_4$, which has a superlattice structure below 24 K due to the anion ordering. One of the most interesting features of this salt is the "tree-like" structure inside the FISDW subphases reported in the caloric measurements, and the tetracritical point in the temperature - magnetic field phase diagram [1]. In spite of considerable theoretical and experimental efforts, the detail of the phase diagram is still controversial. In this study, we have precisely measured the specific heat of $(TMTSF)_2ClO_4$ to clarify the tree-like structure and the detailed phase diagram of this salt.

The specific heat was measured as a function of magnetic field at various different temperatures. Figure 1 shows the second derivative of the specific heat with respect to the magnetic field. We can clearly see the successive anomalies of the cascade transitions of the FISDW subphases. The specific heat shows a jump at the phase boundary between the metal - FISDW phase or each FISDW subphase, corresponding to the white color in Fig.1. Though we have no clear anomaly of the tree-like structure inside the subphases within our resolution, we find the reentrance to the metallic phase between the adjacent FISDW subphases at least in three regions very clearly. Moreover, we noticed that the phase boundary is not a simple line, but seemed to be divided into some sections. The detailed feature of the phase diagram will be discussed and compared with the previous theoretical models.

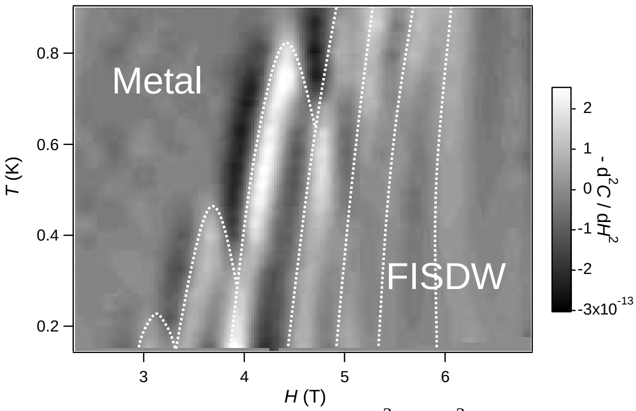

Fig. 1. Image plot of $-d^2C/dH^2$ vs H.

[1] G. Faini *et al.*, J. Phys. (Paris) Colloq. 49, C8-807 (1988).