

## Successive bi-Stable Quantum Phases in HMTSF-TCNQ Induced by Field-Sweep

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HMTSF-TCNQ ( $\rho = 0.74$ ) is one of the organic conductors studied 30 years ago after TTF-TCNQ just before the advent of  $(\text{TMTSF})_2\text{X}$  superconductors [1]. We were interested in the mechanism of suppression of the insulating state by pressure and in the electronic properties in the vicinity of this M-I transition. At  $P = 1.6$  GPa (at 300 K, Daphne7373), the CDW insulating state was not completely suppressed, showing a resistance minimum around 50 - 60 K and a resistance drop below 7.3 K. The magnetoresistance (MR) was examined below 4.2 K as in Fig. 1.

The **remarkable findings are:** i) MR exhibits oscillations already at 4.2 K. ii) the **MR shows hysteresis** below 1.3 K and above 14 T (see Fig. 1). iii) the **oscillatory behavior is observed only with  $H//a$  (secondly conducting axis, i.e.  $\perp$ plane, which is quite unusual)**, iii) the hysteresis is **also** observed with  $H//c^*$  around 14 T. iv) **bi-stable states are seen** in the hysteretic field region. The sweep up and down of the field allows the transition between the bi-stable states. **When crossing** from one state to the other,  **$R$  vs  $H$  sweep is reversible**. This kind of hysteresis reminds us that of  $\tau$ -organic conductor [2], but in this case, what is different is that it is seen in the region of successive quantum oscillations. We conclude about this novel property that the hysteresis is not of orbital but the oscillations are of orbital and **very new**.

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[1] D. Jérôme, Chem. Rev., **104** (2004) 5565, and the related references therein.

[2] D.Graf, E.S.Choi, J.S.Brooks, N.Harrison, K.Murata, T.Konoike, G.A.Mousdis, G.C.Papavassiliou, Phys. Rev. **B71** (2005) 045117.

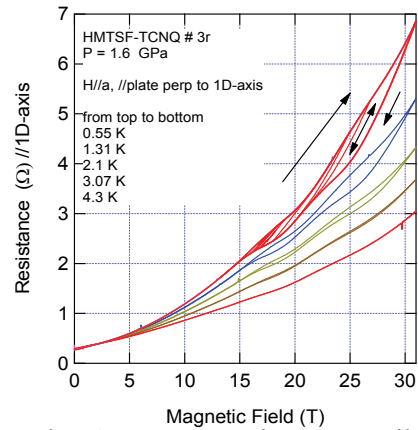


Fig. 1 Magnetoresistance oscillations and its hysteretic behavior in HMTSF-TCNQ.