ANGULAR DEPENDENT MAGNETORESISTANCE MEASUREMENTS UNDER PRESSURE

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Introduction

The organic conductor, $(Per)_2Au(mnt)_2$ becomes an insulator below T_{CDW} ~ 12K, when the material undergoes a charge density wave (CDW) phase transition due to a Peierls distortion along the conducting axis (b-axis). With the addition of pressure, the CDW is partially suppressed; revealing oscillations in magnetoresistance (MR) due to Stark quantum interference between Fermi surface sheets (see Fig 1a, taken from Ref. [1]). Angular dependent measurements of MR under pressure have been carried out in an attempt to observe the phenomena associated with the metallic states of quasi-one-dimensional organic conductors similar to the perylene materials.

Experimental Results

Magnetoresistance measurements were taken under 6 kbar of pressure using ac lock-in techniques. The pressure cell was rotated continuously in a constant magnetic field with several sample orientations and current configurations. Figure 1b shows the resulting MR when the current is applied along the most resistive axis (c-axis) and the sample is rotated in the crystallographic bc-plane.

Discussion and Conclusions

When the field is well-aligned with the b-axis, as in Fig. 1c for $\theta = 90^o$, electron motion is along the k_a direction of the Fermi surface. For the TMTSF-based Bechgaard salts, as the sample is tilted away from the orientation with the field parallel to the conducting stacks, peaks in the MR are observed, known as Danner-Kang-Chaikin (DKC) oscillations [2]. This type of MR peak arises when the electron trajectory in the k_c direction has a width of N Brillouin zones (where N = integer), which causes the average carrier velocity along the c-axis to fall drop to zero (and the MR to increase). In comparison, the angular dependent data for $(Per)_2Au(mnt)_2$ resembles data taken while sweeping the magnetic field in the B//c-axis orientation (i.e. many of the peaks in the rotation data depend on the $B_\perp = B\cos(\theta)$ component of the applied field), but significant differences are apparent and require more analysis.

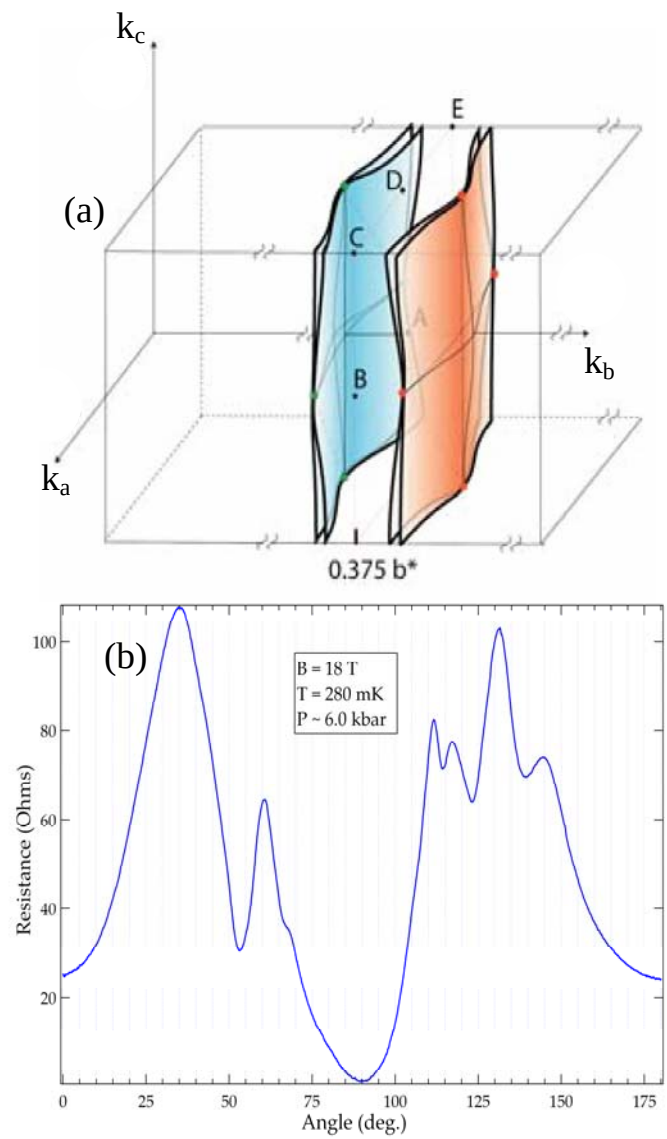

Figure 1. (a) The Fermi surface sheets predicted by band structure calculations in Ref. 1 (b) MR of $(Per)_2Au(mnt)_2$, continuously rotated at B = 18 T over 180°. $\theta = 0^o$ is the B//c-axis orientation.

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References

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[2] G. Danner, *et al.*, Phys. Rev. Lett. **72** 3714 (1994).