EVOLUTION OF THE FERMI SURFACE OF $(PER)_2AU(MNT)_2$ USING HYDROSTATIC PRESSURE

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Introduction

The Fermi surface (FS) of the highly anisotropic molecular conductor, $(Per)_2Au(mnt)_2$ can be approximated as two nearly flat sheets. According to predictions by Canadell, *et al*. [1] asymmetries of the lattice cause two pairs of these sheets to be located very close to one another. Experimental investigation of this is not possible under ambient pressure due to a Peierls lattice distortion along the conducting chains (crystallographic *b*-axis) that leads to a charge density wave (T_{CDW} ~ 12 K). We report here the observation of transport properties of $(Per)_2Au(mnt)_2$ which suggest the suppression of the charge density wave state with pressures > 3 kbar and oscillation phenomena which support the predictions of Ref. 1.

Experimental

A single crystal of $(Per)_2Au(mnt)_2$ was mounted in the B//*c*-axis orientation (with the applied field perpendicular to the most conducting plane) inside a BeCu pressure cell attached via BeCu capillary to a three stage helium gas compressor [2]. The diameter of the cell and size of the helium cryostat require the cell to be immersed directly into the liquid helium bath. To change the pressure, the cell must be raised above the level of the helium bath (while remaining in the cryostat) and heated above the solid-gas phase boundary shown in Fig. 1a. This procedure can be completed while the hybrid magnet maintains full outsert field (~ 11.5 tesla) and in much less time than it takes to change the pressure in a conventional pressure cell, allowing study of a wider range of pressures within the constraints of scheduled magnet time.

Fig. 1b shows that increasing the pressure reduces the sample resistance in lower fields. Previous measurements [3] have shown that the CDW ground state of this compound at ambient pressure can be removed by magnetic fields of ~ 35 tesla. Data taken at 2.66 kbar follows the same behavior. Two distinct peaks first appear at a pressure of 3.84 kbar and more detailed structure becomes visible at 4.78 and 5.75 kbar.

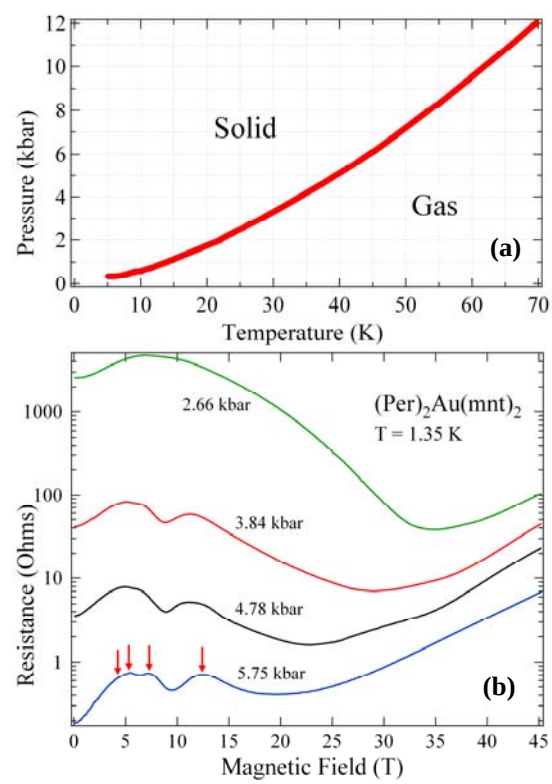

Figure 1. (a) The solid-gas phase diagram of ^4He. (b) Magnetoresistance of $(Per)_2Au(mnt)_2$ with B//*c*-axis under pressure (T = 1.35K).

Discussion and Conclusions

The decrease in magnetoresistance in lower fields with pressure can be attributed to lattice stiffening, which prevents the Peierls distortion from taking place. Peaks in magnetoresistance which develop with higher pressures are caused by quantum interference between FS sheets, as predicted by Ref. 1.

Acknowledgements

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References

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