MAGNETIC TORQUE STUDY OF β-(BDA-TTP)$_2$FeCl$_4$

E. S. Choi (FSU, Physics/NHMFL), T. Tokumoto, D. Graf, J. S. Brooks (FSU, Physics/NHFML),
J. Yamada (University of Hyogo)

Introduction

The π-d interaction strength of a pressure induced superconductor β-(BDA-TTP)$_2$FeCl$_4$ is known to be in the weak limit, which is attributed to the similarity of the phase diagram compared to its non-magnetic analogue β-(BDA-TTP)$_2$GaCl$_4$. Nevertheless, a previous study of magnetoresistance (MR) of β-(BDA-TTP)$_2$*M*Cl$_4$ (M=Fe, Ga) revealed clear distinct behaviors between two compounds [1]. The complex MR behaviors in *M*=Fe compounds were attributed to the change of spin polarization on the anion (FeCl$_4$) site and corresponding changes of spin dependent scattering. In this study, we measured the magnetic torque of β-(BDA-TTP)$_2$FeCl$_4$ in an effort to understand the MR behaviors and underlying spin configurations.

Experimental

Two single crystal samples were glued to the AFM cantilevers so that the bc- or ab-planes were parallel to the magnetic field. The cantilevers were mounted on a rotator holder for the 33T resistive magnet at the NHMFL, which allowed us to measure the magnetic torque at different angles down to 0.5 K.

Results and Discussion

Fig. 1 shows the magnetic torque for the two different samples. It is useful to compare the torque data with the previous MR data shown in Fig. 2. The anomalous behaviors around 5T and 15T corresponds to B* and B** from the MR data (shifted to higher field under pressure). An additional feature around 10 T for B||a configuration was also detected from a separate MR measurement later. Considering the orientation dependence of the transitions, it is likely that the high field transition is associated with a full polarization of the localized spins, while the 5T and 10 T transitions with the canted antiferromagnetism.

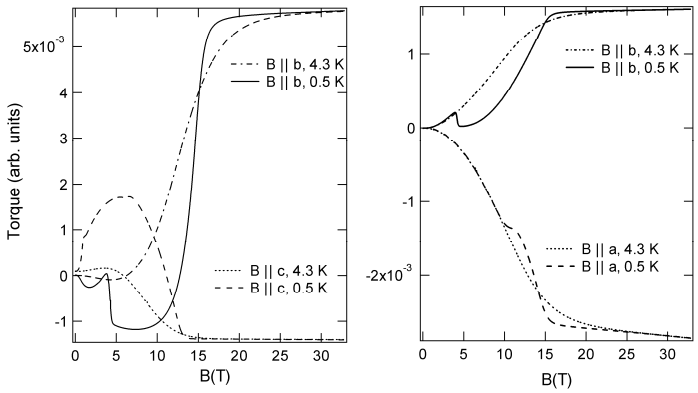

Fig. 1. Field dependence of magnetic torque at different orientations and temperatures.

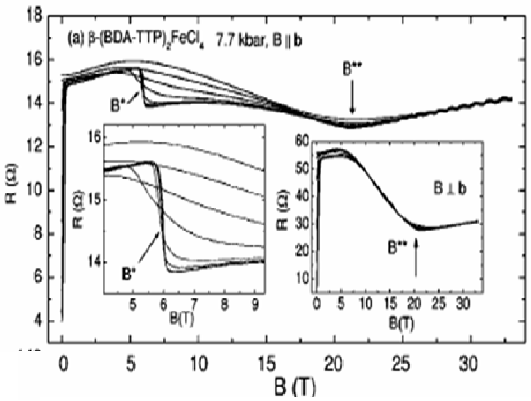

Fig. 2. Magnetoresistance under pressure at two different orientations (from Ref. [1]).

Acknowledgements

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References

[1] Choi E.S. *et al.*, Phys. Rev. B **70** 024517 (2004).