

Torque Magnetometry Measurements of $\text{TPP}[\text{Fe}(\text{Pc})\text{X}_2]_2$ ($\text{X}=\text{Br}, \text{Cl}$)

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The $\text{TPP}[\text{Fe}(\text{Pc})\text{X}_2]_2$ ($\text{X} = \text{CN}, \text{Cl}$ and Br) salts are one dimensional conductors with both the local magnetic moment derived from $\text{Fe}(\text{III})$ d electrons and the π conduction electrons derived from phthalocyanin ring [1, 2]. These compounds exhibits giant negative magnetoresistance (GNMR). In this paper, we report magnetic-torque measurements on $\text{TPP}[\text{Fe}(\text{Pc})\text{Br}_2]_2$. Figures 1 and 2 respectively show the torque curves for the magnetic field rotated within the crystallographic ab plane, and the field dependence of the torque at $\theta = 22.5$ deg. The direction of $\theta = 0$ deg is parallel to the projection of $\text{Fe}-\text{Br}$ axis on the ab -plane. As increasing the field, a saw-tooth-like and then the complicated torque curve appear. By taking into account of the analysis for the CN salt [3], the former suggests the spin-flop transition of π conduction electrons, while the latter seems to be associated with the spin-flop transition of d -electrons. Detailed analyses are underway.

[1]N. Hanasaki *et al.*, Phys Rev. B **62**, 5839 (2000).

[2]D. E. C. Yu *et al.*, J. Mater. Chem. **19**, 718 (2009).

[3]H. Tajima *et al.*, Phys. Rev. B **78**, 064424 (2008).

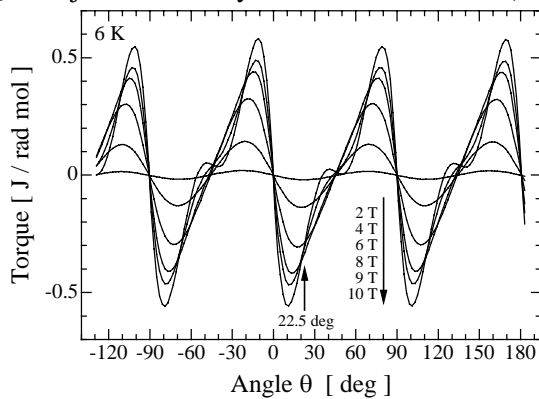


Fig.1 Torque curves of $\text{TPP}[\text{Fe}(\text{Pc})\text{Br}_2]_2$ at 6 K

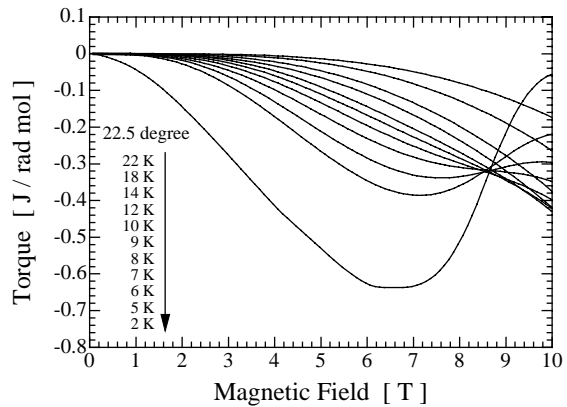


Fig.2 Field dependences of the torque at $\theta = 22.5^\circ$