Interplay between magnetism and conductivity in TPP[Fe(Pc)(CN)$_2$)$_2$

Interplay between magnetism and conductivity has brought about various intriguing phenomena especially in strongly correlated materials. The large magnetoresistance (MR) effect arising from such interplay, for instance, is a central issue in solid-state physics. A magnetic organic conductor, TPP[Fe(Pc)(CN)$_2$], has one-dimensional conducting chains of stacked dicyano(phthalocyaninato) iron Fe(Pc)(CN)$_2$ molecules. The Fe(Pc)(CN)$_2$ molecule has both $\pi$ electron on the Pc ligand and the local 3$d$ magnetic moment at the central Fe$^{3+}$ ion, where they are strongly coupled with each other. The conductance at constant bias voltage (Fig. 1) shows a drastic increase near $B=15T$ at low temperatures, which is associated with the steep change in the magnetic torque [Fig. 2(a)]. The results clearly demonstrate that the conducting behavior of the $\pi$ electrons is strongly affected by the magnetic state of the Fe 3$d$ moments. The detailed analyses show that the magnetic potential formed by the 3$d$ moments is significantly reduced at about 15 T [Fig. 2(b,c)].

For details, see an article, “Interplay between magnetism and conductivity in the one-dimensional organic conductor TPP[Fe(Pc)(CN)$_2$]$_2$” by M. Kimata (A03), Y. Takahide (A03), A. Harada, H. Satsukawa, K. Hazama, T. Terashima, and S. Uji(A03), T. Naito (A02) and T. Inabe(A02), Phys. Rev. B 80, 085110 (2009)