A Diradical Semiconductor with Large Organic Magnetoresistance

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Organic magnetoresistance (OMAR) is a phenomenon in which low magnetic fields can greatly change electric current in organic semiconductor devices with nonmagnetic electrodes.[1] OMAR has gained much attention due to its potential applications such as magnetoresistive sensors and memories.[2] In our search for high-performance materials for OMAR, we focused on the organic semiconductors with diradical character, which have unique open-shelled structure with unpaired electrons interacted through the π-conjugation.[3] To date, organic diradical molecules have not been reported for OMAR application.

In this presentation, molecular design, diradical property, and OMAR effect of a new quinoidal molecule (**BDTQ**, Fig. 1) will be discussed. **BDTQ** has a stable diradical character, and the OMAR devices based on **BDTQ** show large magnetoconductance response near 20% (Fig. 2) depending on the measurement temperatures. This is the first report of the diradical organic semiconductors that show OMAR.

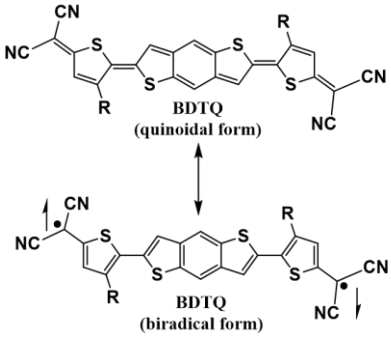

Fig.1 Resonance structures of **BDTQ**

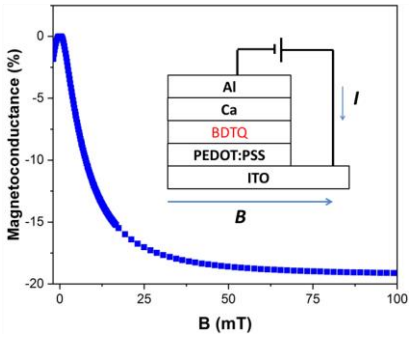

Fig.2 OMAR effect of **BDTQ**

Reference

[1] a) P. A. Bobbert et al. *Phys. Rev. Lett.* **2007**, *99*, 216801; b) T. L. Francis et al. *New. J. Phys.* **2004**, *6*, 185. [2] W. J. Baker et al. *Nat. Commun.* **2012**, *3*, 898. [3] M. Abe *Chem. Rev.* **2013**, *113*, 7011−7088.