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Inter-Molecular Spin-Orbital Coupling Effects on Magnetoresistance and Spin-Dependent Excited Processes in Organic Semiconductors LIANG YAN, BIN HU, University of Tennessee — A low magnetic field can change electrical current and electroluminescence in organic semiconductors, leading to magnetoresistance and magnetic field effects due to magnetic field-dependent singlet/triplet ratio involved in charge transport and excited states. In general, an external magnetic field can change singlet and triplet ratios through two major pathways: spin-dependent electron-hole pairing and field-dependent intersystem crossing. We found that tuning inter-molecular spin-orbital coupling leads to a significant change in magnetoresistance, electro-fluorescence, and electro-phosphorescence. These experimental findings indicate that (i) inter-molecular and intra-molecular electron-hole pairs account for magnetoresistance and magnetic field effects, respectively, (ii) spin mixing occurs in inter-molecular excited states, and (iii) spin-mixing is a function of both spin-orbital coupling and singlet-triplet energy difference. This presentation will discuss the effects of magnetic field on both spin-dependent electron-hole pairing and spin mixing in magnetoresistance and magnetic field effects in organic semiconductors.

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