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Influence of Interactions between Excited States on Magnetic Field Effects in Organic Semiconducting Materials LEI HE, BIN HU, MINGXING LI, Department of Materials Science and Engineering, University of Tennessee-Knoxville, AUGUSTINE URBAS, Air Force Research Laboratory — The magnetic field effects in organic semiconducting materials are essentially determined by spin-exchange interaction and hyperfine interaction within individual intermolecular excited states. Intermolecular excited states can inevitably experience interactions between them due to their spatially extended wavefunctions. This interaction can be involved in the development of magnetic field effects, but this important issue has not been discussed. We study the influence of interactions between intermolecular excited states on magnetic field effects by using magneto-photoluminescence based on well-controlled organic composite containing N,N-dimethylaniline and pyrene in liquid state. We find that the interactions between intermolecular excited states can cause a line-shape narrowing in magneto-photoluminescence. The line-shape narrowing indicates that the interactions between the intermolecular excited states can decrease the force-constant of magnetic field-dependent singlet-triplet intersystem crossing within individual intermolecular excited states. Our studies show that the interactions between the excited states can occur through three different regimes, namely long-range Coulomb interaction, mid-range spin-orbital interaction, and short-range spin interaction, and consequently influence the spin-conserving and spin-dephasing processes within individual intermolecular excited states in the development of magnetic field effects in organic semiconducting materials.

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