Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Magnetic Field Effects on Intersystem Crossing in Polaron-Pair, Excitonic, and Charge-Transfer States in Organic Semiconducting Materials[1] LIANG YAN, BIN HU, University of Tennessee — The singlet-triplet intersystem crossing can be magnetic field dependent in organic semiconducting molecules. This field-dependent intersystem crossing accounts for the magnetic properties of these non magnetic organic semiconducting molecules. Therefore, the study of the dependence of magnetic field on the intersystem crossing can enhance the understanding of intrinsic magnetic responses of excited states and also expend the application of non magnetic organic materials to magnetic devices. In this report we will present our recent investigations: magnetic field effects on singlet-triplet intersystem crossing based on the selected polaron-pair, excitonic, and charge-transfer excited states by using magnetic field-dependent electroluminescence, photoluminescence, and photocurrent. Our experimental results show that the intersystem-crossing dependence of magnetic field significantly decreases as the internal electron-hole distance is reduced in an excited state. This phenomenon indicates that the electron-hole distance essentially determines the intersystem-crossing dependence of magnetic field through the competition between the Zeeman splitting of triplet sublevels caused by applied magnetic field and the intrinsic singlet-triplet energy difference generated by the distance-dependent spin-exchange interaction. As a result, changing the electron-hole distance presents a new mechanism to magnetically tune the optoelectronic properties of non magnetic organic semiconducting molecules.

[1]The research is supported by AFOSR and NSF

Bin Hu
University of Tennessee

Date submitted: 28 Dec 2007 Electronic form version 1.4