Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

$\pi-$d Electron Coupling in Excited State in Organic-Magnetic Nanocomposites MINGXING LI, Univ of Tennessee, Knoxville, MIN WANG, University of Massachusett, LEI HE, YU-CHE HSIAO, QING LIU, HENGXING XU, Univ of Tennessee, Knoxville, LONG Y. CHIANG, University of Massachusett, LOON-SENG TAN, AUGUSTINE URBAS, Wright-Patterson Air Force Base, BIN HU, Univ of Tennessee, Knoxville — The coupling between π electron in organic semiconducting materials and d electron in ferromagnetic materials presents an important mechanism, namely π-d electron coupling, to develop magneto-optical and magneto-electronic properties. The π-d electron coupling has been heavily studied in ground state. This presentation reports the π-d electron coupling in excited state by combining intramolecular charge-transfer dipoles in semiconducting π electron system with spin dipoles from surface-modified magnetic nanoparticles based on organic-magnetic nanocomposites. Our magneto-dielectric studies show that the excited state has a much stronger π-d electron coupling, as compared to ground state, under photoexcitation. We further study the coupling mechanism by analyzing the line-shape of magneto-dielectric response. We find that increasing the Coulomb interactions between electrical dipoles and spin dipoles causes a line-shape narrowing. On contrast, increasing the spin interactions between them leads to a line-shape broadening. As a result, we conclude that the long-range Coulomb interactions and short-range spin interactions are responsible for realizing strong π-d electron coupling in excited state in organic-magnetic nanocomposites.

Mingxing Li
Univ of Tennessee, Knoxville

Date submitted: 08 Nov 2014 Electronic form version 1.4