Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Hyperfine spin interactions between polarons and nuclei in organic light emitting diodes: Magneto-EL measurements S.A. CROOKER, M.R. KELLEY, N. MARTINEZ, W. NIE, A.D. MOHITE, D.L. SMITH, S. TRETIAK, Los Alamos National Laboratory, P.P. RUDEN, University of Minnesota — Considerable attention in recent years has focused on the effects of applied magnetic fields on the conductance, photocurrent, electroluminescence (EL), and photoluminescence of nominally nonmagnetic organic semiconductor materials and devices. These magnetic field effects have proven useful in revealing the underlying physical mechanisms and relevant spin interactions that influence the electrical and optical properties in these organic systems (e.g., hyperfine coupling, exchange interactions, and spin-orbit coupling). Here we study the field-dependent properties of organic light-emitting diode (OLEDs) based on MTDATA/LiF/Bphen layered structures, in which exciplex recombination at the interface dominates the EL spectra. Small applied magnetic fields ($\sim$10 mT) are found to boost the net EL yield by up to 10%, due to a suppression of the mixing between singlet and triplet polaron pairs which, in turn, arises from hyperfine spin coupling of the polarons to the underlying nuclei of the host molecules. We discuss the dependence of these field-induced effects on the LiF barrier thickness, device bias, and on the orientation of the applied magnetic field, as well as the mechanisms responsible.

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Date submitted: 15 Nov 2013 Electronic form version 1.4