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A Comparison Between Magnetic Field Effects in Excitonic and Exciplex Organic Light-Emitting Diodes KEVSER SAHIN TIRAS, YIFEI WANG, NICHOLAS J HARMON, MARKUS WOHLGENANNT, MICHAEL E FLATTE, University of Iowa — In flat-panel displays and lighting applications, organic light emitting diodes (OLEDs) have been widely used because of their efficient light emission, low-cost manufacturing and flexibility. The electrons and holes injected from the anode and cathode, respectively, form a tightly bound exciton as they meet at a molecule in organic layer. Excitons occur as spin singlets or triplets and the ratio between singlet and triplet excitons formed is 1:3 based on spin degeneracy. The internal quantum efficiency (IQE) of fluorescent-based OLEDs is limited 25% because only singlet excitons contribute the light emission. To overcome this limitation, thermally activated delayed fluorescent (TADF) materials have been introduced in the field of OLEDs. The exchange splitting between the singlet and triplet states of two-component exciplex systems is comparable to the thermal energy in TADF materials, whereas it is usually much larger in excitons. Reverse intersystem crossing occurs from triplet to singlet exciplex state, and this improves the IQE. An applied small magnetic field can change the spin dynamics of recombination in TADF blends. In this study, magnetic field effects on both excitonic and exciplex OLEDs will be presented and comparison similarities and differences will be made.

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