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Magnetic field effects in regio-regular polythiophene based devices and thermally activated delayed fluorescence organic light emitting diodes KEVSER SAHIN TIRAS, YIFEI WANG, University of Iowa, JAMES RYBICKI, University of Wisconsin, NICHOLAS J. HARMON, MARKUS WOHLGENANNT, MICHAEL E. FLATTE, University of Iowa — We examine magnetic field effects in regio-regular polythiophene (P3HT) based devices and devices fabricated from a blend that exhibits thermally-activated delayed fluorescence (TADF). A sign change in magnetoresistance (MR) in regio-regular P3HT devices was observed as the bias is increased. By comparing conductance and electroluminescence measurements, as well as fabricating unipolar and bipolar devices, with disentangle two regimes of magnetic-field effects occurring in the same material system: bipolaron MR and excitonic magnetoelectroluminescence (MEL). MEL measured at a constant current demonstrates that the electroluminescence efficiency of a device can be enhanced by the application of an external magnetic field. However, the size of the effect in P3HT (and other materials that have been studied) is relatively modest, of the order of 10% typically. Light efficiency improvement is reported at the presence of an applied magnetic field to certain TADF-based organic light-emitting diodes. We show how this drastic difference arises from fundamental differences in the spin-dependent channels that participate in the magnetic-field effects.

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