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Electrically detected coherent spin manipulation of polaron pairs in an MEH-PPV OLED HEATHER SEIPEL, DANE MCCAMEY, SEOYOUNG PAIK, MANFRED WALTER, NICK BORYS, JOHN LUPTON, CHRISTOPH BOEHME, Department of Physics, University of Utah — Understanding of spin relaxation in organic light emitting diodes (OLEDs) is important for determining the maximum device efficiencies, due to the spin dependence of electronic transitions in organic materials. Here, we present an experiment demonstrating that coherent spin motion of polaron spin pairs can influence the current through an OLED fabricated using the prototypical conjugated polymer poly[2-methoxy-5-(2′-ethyl-hexyloxy)-1,4-phenylene vinylene] (MEH-PPV). We observe a change in the zero-bias photocurrent transient through an OLED device following a short, coherent microwave pulse resonant with polaron pair spin transitions. The shape of the current transient provides information about the recombination rates of polaron pairs in both the singlet and triplet configurations. By varying the length of this pulse, coherent Rabi oscillations are detected, which reveal that the polaron pairs responsible for the signal remain coherent for $>0.5\mu$s. Due to these extremely long coherence times, we conclude that spin mixing processes are unable to significantly influence the spin state of the polaron pairs.

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