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Triplet excitons in a ladder-type conjugated polymer: application in organic optoelectronics¹ K. YANG, M. ARIF, S. GUHA, University of Missouri-Columbia — Trace concentrations of metallic impurities present at the ppm level in conjugated polymers allow photophysical studies of triplet states at room temperature. We present temperature- dependent photoinduced absorption (PIA) and photoluminescence studies of diaryl (diphenyl)-substituted ladder-type poly (paraphenylene) (PhLPPP) containing a trace concentration of covalently bound Pd atoms. The T_1 - T_N peak (~ 1.3 eV) observed in the PIA blue shifts with increasing temperatures at a rate higher compared to the blue shift of singlet excitons in the sample with increasing temperatures. The temperature shift of the PIA signal arises both due to the temperature dependence of the triplet mobility as well as its mean free path. Our observations suggest that with increasing temperatures the triplet excitons remain localized on smaller chain segments. A triplet lifetime of ~ 12 ns was determined at room temperature. Furthermore, we will discuss the application of triplet state enhanced polymers in photovoltaic applications.

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