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Exciton Dissociation by a Static Electric Field Followed by Nanoscale Charge Transport in PPV Polymer HIKMAT NAJAFOV, Lehigh University, IVAN BIAGGIO, Lehigh University, TA-KO CHUANG, Lehigh University, MILTIADIS K. HATALIS, Lehigh University — The nature of the photoinduced generation of charge carriers in conjugated polymers is still the subject of an intense discussion. We investigate the main question of weather photoexcitation results in localized excitons or directly leads to mobile charge carriers by simultaneously studying the electric field dependence of the photoluminescence and the photoinduced charge-transport in a phenyl-substituted PPV derivative. We show that charge-carriers are created indirectly through field-induced ionization of excitons, and by quantitatively estimating the amount of carriers created by ionization of the exciton we identify a free-carrier mobility larger than $\sim 3.0 \times 10^{-6} \mathrm{cm}^2 \mathrm{V}^{-1} \mathrm{s}^{-1}$ that is valid for transport over a few nm during an apparent free-carrier lifetime of $\sim$50 ns. The time-dynamics of the photoluminescence and its temperature-quenching behavior indicate the presence of two species of excitons, which can be interpreted as intra-chain and inter-chain excitons.

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