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Time-resolved Photoluminescence Studies of Various Polymer Heterojunction Films for Photovoltaics STEPHANIE V. CHASTEEN, UC Santa Cruz, GARRY RUMBLES, National Renewable Energy Laboratory (NREL), H.-H. HOERHOLD, H. TILLMAN, University of Jena, Germany, SUE A. CARTER, UC Santa Cruz — Polymer photovoltaics provide a promising avenue for low-cost photovoltaics and other optoelectronics devices, but they are plagued by poor efficiencies. Photogenerated excitons (bound electron-hole pairs) must be separated in order to extract that charge as current. The exciton diffusion range is very short (about 20nm), leading to high recombination. Because excitons may be separated at a junction between an electron- and hole-accepting material, a reliable method of increasing device efficiencies is to create blended or layered heterojunction structures with mixing on the order of 20nm We create blended and layered heterostructures of a hole-transporting polymer (M3EH-PPV) with a variety of canonical electron-transporting materials: an electron-transporting polymer (CN-ether-PPV); PCBM; ITO; and TiO2 solgel and nanoparticles. Using time resolved photoluminescence, we are able to search for new excited state species as well as charge and energy transfer pathways which compete efficiently with charge recombination. Along with traditional device characterization, we thus achieve a rich understanding of how different electron-transporting materials affect exciton dynamics and recombination and thus device performance.

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