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Charge Generation in Photoexcited Large-Diameter Semiconducting Single-Walled Carbon Nanotube/Fullerene Blends KEVIN MISTRY, University of Colorado, Boulder, BRYON LARSON, NIKOS KOPIDAKIS, GARRY RUMBLES, JEFFREY BLACKBURN, National Renewable Energy Lab
— Semiconducting single-walled carbon nanotubes (s-SWCNTs) have a number of extraordinary electrical and optical properties including high charge mobilities and tunable band gaps that make them appealing for FETs and PV devices. Using narrow chiral distributions of large-diameter (d >1.2 nm) s-SWCNTs can be beneficial to these devices through increased carrier mobility and reduced trapping due to energetic differences between different chiralities. Additionally, much of the visible and near-IR region of the solar spectrum can be covered by appropriately tuning the diameter range of these s-SWCNTs along with careful selection of the fullerene acceptor material. Time-resolved microwave conductivity (TRMC) was used to explore charge separation in such s-SWCNT:fullerene (donor:acceptor) blends. TRMC allows for sensitive monitoring of charge generation and decay in response to photoexcitation. We will report on charge carrier lifetime dynamics and changes to free carrier yield in blends using carefully tuned combinations of SWCNT diameters and fullerene acceptors. Furthermore, we will discuss how these results can be used to design enhanced s-SWCNT:fullerene active layers.

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