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Effect of recombination on the open circuit voltage in polymer-fullerene solar cells SARAH COWAN, ANSHUMAN ROY, ALAN HEEGER, Center for Polymers and Organic Solids, UCSB, Santa Barbara, CA 93103 — Polymer-fullerene solar cell response measurements, including intensity-dependent current-voltage and bias-dependent internal quantum efficiency and photoconductivity measurements, probe the density of trap states[1] for three polymers (poly(3-hexylthiophene) (P3HT), poly[N-9′-heptadecanyl-2,7-carbazole-alt-5,5-(4′,7′-di-2-thienyl-2′,1′,3′-
benzothiadiazole)] (PCDTBT), and poly{[4,4'-bis(2-ethylhexyl)dithieno(3,2-b;2',3'-d)silole]-2,6-diyl-alt-(2,1,3-benzothidiazole)-4,7-diyl} (PSBTBT). The short circuit current shows linear dependence and the open circuit voltage shows logarithmic dependence on intensity over four orders of magnitude in intensity. When compared with silicon counterparts, polymer solar cells maintain high open circuit voltage at low light intensity, making them ideal solar cells for low light conditions.

[1]R. Street, M. Schoendorf, A. Roy, J.H. Lee. "Recombination in organic solar cells." Phys. Rev.B. (submitted for publication).

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