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>1.0% solar cell derived from carbon nanotube excitons
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Semiconducting single-walled carbon nanotubes (s-SWCNTs) are promising photoabsorbers for photovoltaics due to their strong optical absorptivity, tunable NIR bandgaps, fast charge transport, and solution processability. We have previously shown that electrons can be extracted from photogenerated excitons in s-SWCNTS by C_{60} with internal quantum efficiency (QE) over 90%. Here, we demonstrate s-SWCNT/C_{60} heterojunction devices with over 1.0% AM1.5G power conversion efficiency for the first time. We implemented highly monochiral (7,5) s-SWCNTs to optimize exciton diffusivity and tailored the device stack to tune the spectral response. External QE of over 35% and 20% are achieved at the E_{11} bandgap of the s-SWCNTs at 1055 nm and the E_{22} transition at 655 nm. More than 50% of the AM1.5G photoresponse is derived from the s-SWCNTs, substantially exceeding previous s-SWCNT hybrid devices in which the photoresponse has mostly originated from the organic phase. This work will lead to solar cells based on s-SWCNT photoabsorbers with higher responsivity across the solar spectrum by tailoring the s-SWCNT film morphology and blending them directly with acceptors.

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