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p-n junction photodetectors based on macroscopic single-walled carbon nanotube films XIAOWEI HE, Applied physics, Rice University, SÉBASTIEN NANOT, Physics Department, Rice University, ROBERT H. HAUGE, Chemistry Department, Rice University, JUNICHIRO KONO, Physics Department, Rice University — Single-Wall carbon nanotubes (SWCNTs) are promising in use of solar technology and photodetection. There have been many reports about photovoltaic effect in nanoelectronic devices based on individual SWCNTs, but they are limited by miniscule absorption. There has been a growing trend for merging SWNTs into mico- and macroscopic devices to provide more practical applications. Here we report p-n junction photodetectors based on macroscopic SWCNTs film. Factors affecting the PV amplitude and response time have been studied, including substrates, doping level. The maximal responsivity $\sim$ 1 V/W was observed with samples on Teflon tapes, while a fast response time $\sim$ 80 μs was observed with samples on AlN substrates. Hence an optimal combination of photoresponse time and amplitude can be found by choosing proper substrates. We found that the PV amplitude increases nonlinearly with increasing n-doping concentration, indicating the existence of an optimal doping concentration. Finally, we checked photoresponse in a wide wavelength range (360 to 900 nm), and PV was observed throughout, indicating that the device could potential be used as a broadband photodetector.

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