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Small-Bundle Single-Wall Carbon Nanotubes for High-Efficiency Silicon Heterojunction Solar Cells

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ABSTRACT

Single-wall carbon nanotubes (SWCNTs) are a promising material for constructing high-performance photovoltaic conversion devices due to their excellent optical and electrical properties. Here we report a high-quality, small-bundle SWCNT film for the fabrication of high-efficiency silicon heterojunction solar cells. The SWCNT film synthesized by floating catalyst chemical vapor deposition has a low sheet resistance of $180 \Omega \text{ sq}^{-1}$ at 90% transmittance, which is more than two times lower than that of previously reported pristine SWCNTs used for SWCNT/Si heterojunction solar cells. Effects of the thickness of SWCNT film and device active area on the performance of the cells were investigated, and high power conversion efficiencies of 14.2% and 11.8% were achieved for devices with active areas of 2.3

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