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Dye-Sensitized Carbon Nano-Yarn Based Photovoltaic Cells with Enhanced Electron-Hole Separation and Barrier Characteristics[1] H. JUSTIN MOORE, MIGUEL LEAL, GLENN GRISSOM, TAREK TRAD, NAZMUL ISLAM, AHMED TOUHAMI, M. JASIM UDDIN, University Texas Rio Grande Valley — Over the last 30 years dye-sensitized solar cells have received considerable interest as an alternative energy source due to their low-cost, environmental sustainability, flexibility, and an abundant number of other practical applications. Flexible carbon nanotube-yarn based photo voltaic cells have shown considerable advantages over metal wire based solar cells or non-flexible substrates like indium-doped tin oxide glass. Carbon nanotubes are superior for photo voltaic cells due to their lower electrical resistance, excellent electrocatalytic activity, and high mechanical integrity. Here, we introduce the use of poly(3-hexylthiophene-2,5-diyl), [6.6] diphenyl C_{62} bis(butyric acid methyl ester), cadmium sulfide-cadmium selenide quantum dots, and ruthenium-based dye N719 to locally increase electron generation, decrease electron-hole pair recombination, as well as enhancing barrier characteristics. Our prototype 3-dimensional carbon nano-yarn based photovoltaic cells show an enhancement in photon to energy conversion efficiency (>6.5%). This along with prolonged environmental stability makes for a very promising solar cell.

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