High performance flexible transparent conductive carbon nanotube films for organic solar cells

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We presented CNT thin films on polyethylene terephthalate (PET). The sheet resistance, optical transmittance, optical conductivity, dc conductivity and flexibility of the fabricated films were measured and compared with those of commercialized flexible indium tin oxide (ITO) films. Electrical conductivities of CNT transparent films were improved by acid treatment of the CNT bundles. The contact resistance between carbon nanotubes decreased by the surface modification and the defects generation by ionic doping. These defects generation improves the electrical conductivity of the CNT transparent electrode films. Sheet resistance of 113Ω/□ and the transmittance at 550nm wavelength of 75% are observed. \( J_{SC} \) of the solar cell with KAuBr₄ treated CNT electrode was slightly deceased from 7.60 to 748mA/cm². Ion doped CNT films show good electrical and optical properties by the generation of the defects on the CNT surface. The CNT electrodes act as substrates that compatible with high-throughput roll-to-roll manufacturing and the flexible solar cells.

Keywords: Carbon Nanotubes, Gold nanoparticles, Transparent conductive films, Organic solar cells