

Polymer Solar Cells Synthesized with Copper Oxide Nanoparticles

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Abstract : Copper Oxide (CuO) is a p-type semiconductor with a band gap energy of 1.5 eV, this is close to the ideal energy gap of 1.4 eV required for solar cells to allow good solar spectral absorption. The inherent electrical characteristics of CuO nano particles make them attractive candidates for improving the performance of polymer solar cells when incorporated into the active polymer layer. The UV-visible absorption spectra and external quantum efficiency of P3HT/PC70BM solar cells containing different weight percentages of CuO nano particles showed a clear enhancement in the photo absorption of the active layer, this increased the power conversion efficiency of the solar cells by 24% in comparison to the reference cell. The short circuit current of the reference cell was found to be 5.234 mA/cm² and it seemed to increase to 6.484 mA/cm² in cells containing 0.6 mg of CuO NPs; in addition the fill factor increased from 61.15% to 68.0%, showing an enhancement of 11.2%. These observations suggest that the optimum concentration of CuO nano particles was 0.6 mg in the active layer. These significant findings can be applied to design high-efficiency polymer solar cells containing inorganic nano particles.

Keywords : copper oxide nanoparticle, UV-visible spectroscopy, polymer solar cells, P3HT/PCBM

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