Improving the photovoltaic properties of organic solar cells by structuring the P3HT:PCBM photoactive layer with functionalized SWCNTs

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Résumé en anglais	The optical and electrical properties of bulk polymer RR-P3HT (Regio-Regular Poly(3-hexylthiophene-2,5-diyl):PCBM (Methanofullerene Phenyl-C61-Butyric-Acid-Methyl-Ester) heterojunction incorporating single wall carbon nanotubes (SWCNTs) have been already reported by a number of research groups. We investigated a new approach to functionalize CarboLex single wall carbon nanotubes (SWCNTs-e) for increasing their dispersion in various solvents. The addition of SWCNTs-e in the matrix of P3HT:PCBM improves the photovoltaic (PV) characteristics. Results show that the photovoltaic parameters depend on the concentration of SWCNTs-e. The incorporation of low concentrations of SWCNTs-e in the photoactive layer increases the current density Jscbefore annealing. We attribute the improved performance to partial crystallisation of the RR-P3HT. As revealed by XRD studies and confirmed by the absorbance spectra which exhibit the characteristic 600 nm shoulder. Interestingly, we observed also that doping the P3HT:PCBM system with the functionalized SWCNTs increases Voc from 0.583 to 0.744 V.
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