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Degradation of organic solar cells with solution processed ZnO

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Abstract content
   (Max 300 words)

Bulk heterojunction Organic photovoltaics devices have drawn a lot of attention as means for the renewable energy conversion due to the remarkable combination of prospective low cost of manufacturing and rapid improvement of performance approaching the traditional silicon solar cells [1]. However, bulk heterojunction organic solar cells can suffer from degradation of the top electrode, which is normally low work-function aluminium (Al) that is reactive and can easily be oxidized in air [2].

In this study we present the performance data of the organic solar cell (OSC) device with ZnO nanoparticles as electron extraction layer. The device was fabricated by spin-coating poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate) (PEDOT:PSS) polymer on a glass substrates pre-coated with a layer of transparent indium-tin-oxide (ITO) followed consecutively by layers of blend of poly(3-hexylthiopene) (P3HT) and [6,6] -phenyl C61-butyric acid methyl ester (PCBM), ZnO nanoparticles and evaporation of aluminium metal as cathode electrode. The configuration of the device is ITO/PEDOT:PSS/P3HT:PCBM/ZnO nanoparticles/Al. The power conversion efficiency (PCE) of 2.37 % was recorded from device with a concentration of 0.5 mg/ml, ZnO nanoparticles as electron extraction layer whereas the PCE of 0.20 % was recorded from the same device after 10 days of storage at ambient laboratory conditions. Furthermore, degradation mechanisms of organic solar cell devices are discussed.

References

[1] W. Ma, C. Yang, X. Gong, K. Lee and A.J Heeger, Adv.Funct.Mater 2005(1617-1622)15

[2] H. Oh, J. Krantz, I. Litzov, T. Stubhan, L. Pinna and C.J. Brabec, Sol.Energy Mater.Sol Cells 2011 (2194-2199) 95

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