Understanding the Effect of Third Component in Bulk Heterojunction Solar Cells: Optical and Electrical Study

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It has been reported that performance of bulk heterojunction organic solar cells can be improved by incorporation of an additive like metal and semiconducting nanostructures in the photoactive layer [1, 2]. Here in, we have procured indene−C60 bisadduct (ICBA) and studied its dispersion in poly[4,8-bis[(2-ethylhexyl)oxy]benzo[1,2-b:4,5-b′]dithiophene-2,6-diyl][3-fluoro-2-[(ethylhexyl)carbonyl]thieno[3,4-b]thiophenediyl] (PTB7) and [6,6]-phenyl-C70-butyric acid (PC70BM) matrix. Variation in the performance parameters with change in the concentration of ICBA into the PTB7: PC70BM matrix has also been studied and it was found that the inverted geometry device with various concentrations of ICBA and having the structure ITO/PEIE/ PTB7: ICBA: PC70BM /MoO3/Al has shown maximum efficiency of 7.52%. Impedance spectroscopy (IS), Transient absorption (TAS) and space charge limited current (SCLC) measurements unveiled that the incorporation of ICBA into the PTB7: PC70BM matrix has helped in understand the charge transfer and recombination resistance at the interfaces between the PTB7 and PC70BM domains.

References

[1] Sankara R. G., Ramakant S., Srinivas G, Souvik K., Dipti G., "Effects of Incorporation of Copper Sulfide nanocrystals on the performance of P3HT: PCBM based Inverted Solar Cells" *Organic Electronics* 15 (2014) 2518–2525.

[2] Sankara R. G., Ramakant S., Srinivas G, Souvik K., Dipti G.," Incorporation of silver and gold nanostructures for performance improvement in P3HT: PCBM inverted solar cell with rGO/ZnO nanocomposite as an electron transport layer", *Organic Electronics* 29 (2016) 79-87.