

Zinc Oxide Nanorods for Hybrid Bulk Heterojunction Solar Cells

H. M. N. K. K. Herath¹, J. I. Ranasinghe¹ and J. M. S. Bandara²

¹Uva Wellassa University, Sri Lanka

²Institute of Fundamental Studies, Kandy

Solar cells are devices which convert energy of photon to the electrical energy by photovoltaic effect. Among the different structures of solar cell devices, the demand for low cost and efficient solar cell is tremendous. Though the polymer photovoltaic devices can be easily fabricated with the available technology, increase in the device efficiency is an upward hurdle due to rapid charge recombination with the increase in thickness of the solar cell. However, this problem can be overcome by blending donor-acceptor materials together allowing better charge separation as well as transport and high cell thickness for harvest more energy from sun light. Bulk heterojunction solar cell overcome that barrier by blending donor acceptor material together which allows good charge transport and high cell thickness for harvest more energy from sun light. Introducing nanostructure inorganic charge transport material charge transport area, charge collection and transport can be enhanced. In this study, ZnO nanorods for Hybrid- bulk heterojunction(HBHJ) solar cells and their performance were studied.

HBHJ solar cells were fabricated employing ZnO nanorod as electron transport media, blend of Poly(3-hexylthiophene) (P3HT) and (6, 6)-phenyl C6-butyric acid methylester (PCBM) as an light active layer and polyethylene dioxythiophene polystyrene (PEDOT: PSS) as a hole transport medium. ZnO nanorods were fabricated on fluorine doped conducting glass (FTO) by electro deposition method and on which the photoactive polymer layer was coated as a thin film using a blend of P3HT: PCBM in chlorobenzene followed by a deposition of a thin layer of PEDOT: PSS by spin coating technique. It was noticed that the performance of solar cell was highly depended on the preparation conditions and the solar cell performance optimization techniques were investigated in this study. The optimized device yielded Voc of 396 mV, photocurrent of 5. mA/cm², a fill factor of 30% with an overall efficiency of 0.62%.

Key words: ZnO nanorods, HBHJ solar cells, spin coating