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## Improving the current density $J_{sc}$ and efficiency enhancement of polymer solar cells P3HT:PCBM via ZnO nanorods

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### Abstract

Applying organic/inorganic hybrid solar cells, with the aim of producing low cost organic photovoltaics (OPV) as well as obtaining other advantages, such as tuneable absorption spectra, by use of inorganic component have attracted the attention of many researchers today. Whilst hybrid solar cells have the potential to achieve high Power Conversion Efficiencies (PCE), currently obtained efficiencies are quite low. The inorganic materials are used as the electron donor in hybrid solar cells, particularly the electronic structure, in order to enhance production power. Hence, in this paper, ZnO nanorods have been synthesized by using zinc acetate dihydrate and polyvinylpyrrolidone (PVP) as starting materials. The obtained powders were calcinated in air at 600 °C for 1 hour and were characterized by XRD, TEM and SEM. Besides, after synthesizing ZnO nanorods and their using as electrode in inverted polymer solar cells, the device operation was enhanced. The average performance of the devices, open circuit voltage, short circuit current density, fill factor, and power conversion efficiency are measured as 0.60V, 8.7 mA/cm<sup>2</sup>, 0.58 and 3.01%, respectively. The results indicate that the structure of ZnO nanorod can effectively serve as an electrode for inverted polymer solar cells.

**Keywords:** ZnO, nanorod, sol-gel, polymer solar cell, photovoltaic organic / inorganic

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