

Surface engineering of ZnO nanorod for inverted organic solar cell

ABSTRACT

Crystallinity and band offset alignment of inorganic electron acceptor play a vital role in enhancing the device performance of inverted organic solar cell (IOSC). In this report, homogenous and vertically-aligned chemical treated ZnO nanorods (ZNR) were successfully grown on fluorine-doped tin oxide (FTO) substrate via a fully-solution method. It was found that the morphology of ZnO was fine-tuned from truncated surface to tubular structure under both of the anionic (KOH) and protonic (HCl) treatment. An extraordinary defect quenching phenomenon and hyperchromic energy band edge shift were observed in 0.1 M KOH-treated ZNR proven by the highest (0 0 2) peak detection and the lowest defect density. Compared with the pristine sample, the 0.1 M KOH-treated ZNR device showed a remarkable improvement in power conversion efficiency (PCE) up to 0.32%, signifying the effectiveness of anodic treatment. The robust correlation between the dependency of chemical treated ZNR and the device performance was established. This work elucidates a feasible method towards efficient IOSC devices development.

Keyword: Crystal growth; Defect; Energy band gap; HCl; Structural; KOH