Photoelectrochemical and Optical Properties of ZnO Nanorods Grown on ITO/polyethersulphone Polymer Substrates Using Aqueous Solution Method: The Effect of Precursor Concentration

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Well-aligned ZnO nanostructures were successfully grown on indium tin oxide (ITO)/polyethersulphone (PES) polymer substrates using aqueous solution method to study the precursor concentration effect on photoelectrochemical and optical properties of prepared samples. Field-emission scanning electron microscopy (FESEM) was used to characterize the surface morphology of the samples. Photoelectrochemical and optical properties of ZnO nanorods were done by UV–vis spectrophotometer, photoluminescence (PL) and solar simulator tests. The FESEM images demonstrated that smaller diameter and higher-density distribution of ZnO nanorods were observed in the sample with 0.06 M precursor concentration. The optical absorption revealed that the sample with 0.06 M precursor content indicated strangely improved absorption compared to the other samples which can be ascribed to the aspect ratio of the ZnO nanostructures. The PL measurements of the samples demonstrated a strong and sharp enhancement in UV emission peak at a low concentration (0.06 M) of precursor. Photoelectrochemical performance revealed that a proper amount of precursor significantly improve the conversion efficiency and short current density values compared to that of high amount of precursor which can be attributed to the sufficient light harvesting, more dye absorption and fast charge transfer of the sample.

Keywords: ZnO nanorods; Polyethersulphone polymer substrate; Aqueous solution method; Photoelectrochemical and optical properties; Precursor concentration

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