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Enhanced structural and optical properties of ZnO nanorods synthesized via a modified sol-gel method

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A photo-anode semiconducting material with a nanorod geometry, hierarchical morphology, large surface area and high purity would yield good electron transport, effective dye loading and higher photon harvesting yielding a higher solar photon conversion [1]. The synthesis of these nanostructures could be achieved through sol-gel synthesis, hydrothermal synthesis, physical or chemical vapor deposition techniques, chemical bath deposition or electrochemical deposition etc. [2-5]. Among these methods, sol-gel method provides a facile and inexpensive synthesis of one-dimensional nanostructure without the use of sophisticated equipments or rigorous conditions [6].

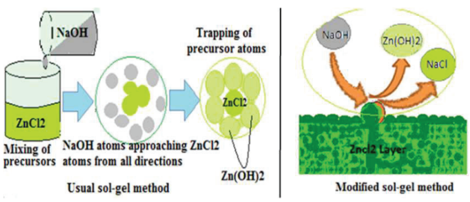

Figure 1: Usual and modified sol gel method

The oxidative etching modified sol-gel method reduces the random reaction of precursors, leading to a slow and controlled nucleation process.

We shall herein report a facile, environmental friendly, modified sol-gel synthesis route to hierarchical ZnO nanorods of high purity and large surface area, which could enhance the solar conversion efficiency of dye sensitized solar cells.

The as-synthesized ZnO nanorods were characterized using X-ray diffraction (XRD), Field emission scanning electron microscope (FESEM), UV-Vis spectroscopy (UV-Vis), Photoluminescence spectroscopy (PL) and BET analysis, which revealed impurity-free, highly crystalline, mesoporous and large surface-area, wurtzite phase ZnO nanorods with a diameters of 40-55 nm and a length of 200-225 nm, having a surface area of 152 m^2g^{-1}. The characterizations have been investigated keeping the prime factors of efficient photo-anodes into considerations.

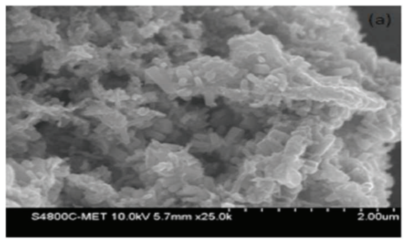

Figure 2: FESEM micrographs of ZnO nanorods

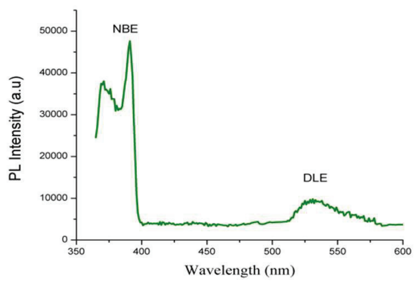

Figure 3: PL spectrum of ZnO nanorods

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