

ZnO-DSSC: Synthesis, Fabrication and Electrical Characterization

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Zinc oxide (ZnO) has been significantly investigated for its versatile physical and chemical properties. ZnO, an II-VI semiconductor with a wide direct band gap 3.37 eV, has attracted great attention as a promising candidate for applications in UV light emitters, field emissions, biosensors, field effect transistors, and dye-sensitized solar cells (DSSCs). DSSCs are a new type of photo electrochemical solar cells. In addition, ZnO with high electronic mobility is expected to increase the electronic mobility of the film, and the synthesis of ZnO nanostructure is much simpler than that TiO₂. Hydrothermal method (HT) is evolving in recent times for preparation of ZnO. In this study, ZnO nanopowders were synthesized by HT at different synthesis temperatures to improve the surface morphology of the particles to absorb the dye. The phases and morphologies of the ZnO were investigated using X-ray diffraction (XRD), scanning electron microscopy (SEM), respectively. To measure the photo electrochemical properties of the obtained ZnO nanopowders, ZnO film was prepared on conducting glass sheets (FTO) by using doctor blade method. Then the film was calcined at 400°C for 1 h. After the film cooled down to room temperature, it was immersed in ruthenium based and organic dye solutions for 2 h at room temperature. The current–voltage characterization of fabricated DSSCs was performed by AM 1.5 simulated sunlight at 100 mW/cm². The short current (I_{sc}), open circuit voltage (V_{oc}), conversion efficiency ($\eta\%$) and fill factor (FF) of ZnO-DSSCs were determined. ZnO DSSCs were kept for one day and the measurements were repeated.