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Characterization of SnO₂ Nanostructure/TiO₂ Bifunctional Photoanode for Dye-Sensitized Solar Cell

Abstract:

Tin oxide (SnO₂) nanostructure thin film was synthesized on glass and FTO glass substrates at 450 °C with flow rates of Argon and oxygen (8 L/h) using the atmospheric pressure chemical vapor deposition (APCVD) method. The surface morphology, structure and optical properties of SnO₂ film were depicted by Field Emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD) and UV–Visible (UV–Vis) spectroscopy, respectively. The optical band gap of SnO₂ film was found to be 3.72 eV. In addition, a layer of titanium oxide was deposited on the SnO₂ film using a screen printing method. Then, the anodic electrode was immersed in the dye to complete cell manufacturing. It was found that the short circuit current, open circuit voltage and fill factor in the case of the prepared dye-sensitized solar cell (DSSC) were 8.7 mA/cm², 0.85V and 0.583, respectively, which led to the efficiency of 4.3. It was also found that the optical response speed of the prepared photoanode showed a periodic response and a high on/off ratio.