

Aerosol assisted chemical vapour deposited (AACVD) of TiO₂ thin film as compact layer for dye-sensitised solar cell

ABSTRACT

Compact TiO₂ has been introduced onto the surface of an indium tin oxide glass slide (ITO), using an aerosol-assisted chemical vapour deposition method. This serves as a blocking layer for a dye-sensitised solar cell (DSSC). The thickness of the compact TiO₂ could be controlled by deposition time. X-ray diffraction and Raman spectroscopy analyses reveal that the compact TiO₂ is made up of mixed anatase and rutile phases. The field emission scanning electron microscopy image displays a pyramidal morphology of the compact TiO₂. A layer of P25 paste was then smeared onto the compact TiO₂-modified ITO, using the doctor's blade method. A post-treatment procedure was applied to remove the contaminants from the prepared hybrid film, by immersing in a hydrochloric acid solution. The photoelectrochemical measurements and J–V characterisation of the hybrid film show an approximately fourfold increase in photocurrent density generation (114.22 $\mu\text{A}/\text{cm}^2$), and approximately 25% enhancement of DSSC conversion efficiency (4.63%), compared to the acid-treated P25 paste alone (3.68%).

Keyword: D. TiO₂; AACVD; Chemical vapour deposition