

Optimization of power conversion efficiency of polyvinyl-alcohol/titanium dioxide as light scattering layer in DSSC using response surface methodology/central composite design

ABSTRACT

This study focused on the optimization of polyvinyl-alcohol/titanium dioxide (PVA/TiO₂) nanofibers as a light scattering layer in the dye-sensitized solar cell. The experiment was designed by response surface methodology with central composite design (RSM/CCD). Two parameters were studied i.e. electrospinning time and concentration of titanium tetraisopropoxide (TTIP). A quadratic model was used to determine the significance of each parameter studied towards the surface response which is power conversion efficiency (PCE). The statistical analysis showed that the electrospinning time and concentration of TTIP were significantly affected the PCE with the coefficient of variance (R²) of 0.9756. The RSM was able to predict the optimum condition of each parameter with less than 5% residual standard error.

Keyword: Dye-sensitized solar cell; Compact layer; Titanium tetraisopropoxide; Polyvinyl alcohol; Response surface methodology; Experimental design