

## Effects of TiO<sub>2</sub> Blocking Layer on Photovoltaic Characteristics of TiO<sub>2</sub>/Nb<sub>2</sub>O<sub>5</sub> Dye Sensitized Solar Cells.

### Abstract

This study reports on the effect of introducing TiO<sub>2</sub> compact layer on the photovoltaic characteristics of TiO<sub>2</sub>/Nb<sub>2</sub>O<sub>5</sub> composite dye sensitized solar cell. The compact layer was deposited by spray pyrolysis technique. It was observed that introduction of 60 nm thick compact layer improved the short circuit current density  $J_{sc}$ , Open circuit voltage  $V_{oc}$ , and efficiency of the cell from 4.9 mA/cm<sup>2</sup> to 8.2 mA/cm<sup>2</sup>,  $6.8 \times 10^{-1}$  V to  $7.2 \times 10^{-1}$  V and 1.9 % to 3.4 % respectively compared to traditional cell prepared without compact layer. Electrochemical impedance spectroscopy confirmed an increase in recombination resistance from  $5.5 \times 10^1 \Omega \cdot \text{cm}^2$  for bare DSSC to  $9.0 \times 10^1 \Omega \cdot \text{cm}^2$  for DSSC with compact layer thereby improving electron lifetime of the cells from  $2.5 \times 10^{-4}$  s to  $386.9 \times 10^{-4}$  s.

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