507/E1

Electroplated nickel grids for dye-sensitized photo electrochemical solar panels

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Photovoltaic effect of dye deposited semiconductor thin films and their utilization in photo electrochemical (PEC) solar cells have been extensively investigated in the past decades. There are some drawbacks that suppress the efficiency of the photo electrochemical solar cells. One of the major problems is high sheet resistance of CTO glass. Photocurrent generated in the cells is reduced due to this series sheet resistance. Therefore Nickel grids were deposited on the CTO glass that was used to construct dye-sensitized PECs to improve the efficiency and to minimize the internal power dissipation.

$NiSO_4$ solution was prepared dissolving 2 g of $NiSO_4$ in 50 ml of deionized water and this solution was used to electrodeposit grids on CTO glass prior to the fabrication of PEC cells. Since the grid deposited CTO glass was sintered at 400 °C to coat the TiO_2 film, we also verify the stability of Ni grids at high temperatures. We have noticed that silvery colour of Ni grids preserve up to 500 °C when the grids were sintered at open air. The I– V curves of the PEC cells with nickel grids have shown a good fill factor and a high photocurrent. Sheet resistance of the PEC cell with electroplated nickel grids is much lower than that of CTO glass. Incorperating electroplated nickel grids on PEC cells help to minimize sheet résistance, enhance photocurrent, fill factor and fast rate of charge collection. Commercially available large area PEC solar cells are associated with power loss and efficiency drop due to the sheet resistance of the CTO glass. Electroplated Ni grids on CTO glass are a good solution to overcome this problem.