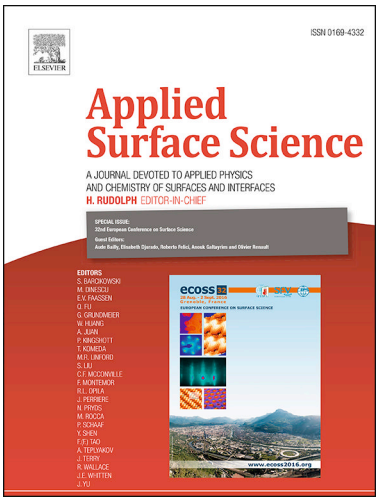

Full Length Article

MoO_3 Surface Passivation on TiO_2: An Efficient Approach to Minimize Loss in Fill factor and Maximum Power of Dye Sensitized Solar Cell

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ABSTRACT. The present study demonstrates the possibility for improving the performance of dye sensitized solar cell (DSSC) only by minimizing the loss in fill factor (*FF*) and maximum power point (P_{MAX}) which can be achieved by passivating the nanocrystalline titanium dioxide (TiO_2) using physical vapor deposited molybdenum trioxide (MoO_3) thin films. The effect of MoO_3 coated TiO_2 on charge carrier transport was examined in resulting DSSCs and observed that ~14 % enhancement in efficiency is possible for 5 minutes passivation of MoO_3 on TiO_2. The physical vapor deposited MoO_3 films were ~ 75 % transparent in the spectral range of 350 nm-800 nm with an optical bandgap of ~3.1 eV. The wide bandgap MoO_3 films facilitate the incoming photons to reach the sensitizing dye to generate excitons. The 14 % enhancement in the performance of DSSC by MoO_3 passivation is observed through improving only the *FF* and P_{MAX} while it does not contribute anything significantly to current density and open circuit voltage. Electrochemical impedance spectroscopic studies further confirmed these observations through photo-electron lifetime, which remains constant both in the bulk of pristine TiO_2 and MoO_3 passivated TiO_2 and it further confirms the effect of MoO_3 passivation on *FF* and P_{MAX} in DSSCs.

Key words: defects, MoO_3, charge transport, recombination, solar cell, passivation