

Application of cauli-flower shaped polyaniline (PANI) and tin oxide (SnO₂) composite counter electrode for dye-sensitized solar cells

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In dye-sensitized solar cells (DSSCs), a thin film of platinum (Pt) has been extensively used as the catalytic material in the counter electrode (CE) due to its superior conductivity and high electro-catalytic activity. Recently, the CE as a major component of DSSCs, has received considerable attention due to expensive and limited supply of Platinum (Pt). In order to replace the Pt based counter electrodes by low cost materials with high electronic conductivity and comparable catalytic activity on tri-iodide reduction, various potential alternative materials are being investigated. Conducting polymer is one of the promising candidates for CE materials used in DSSCs as an efficient Pt free CEs. Among conducting polymers, polyaniline (PANI) is one of the most attractive materials, because of its easy synthesis, considerable catalytic activity, and good environmental stability. In this study, polyaniline (PANI) based CEs were prepared by spray technique. In order to improve the adhesion of PANI on conducting glass substrate, SnO₂ nanoparticles were mixed with PANI. The SEM images revealed that the sprayed PANI/SnO₂ composite based CE exhibits a cauli-flower surface morphology. Impressive 30 % increment in the power conversion efficiency (η) of DSSC was observed from 4.83 % to 6.27 % with the addition of SnO₂. This novel PANI/SnO₂ composite CE exhibits good stability and performance comparable to that of the Pt coated CE ($\eta = 8.12\%$) in DSSCs operating under similar conditions.

Key words: *Counter electrode, Dye-sensitized solar cells, Polyaniline, Tin oxide*

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