

Dye-Sensitized Solar Cells with Pt-Free, Three-Dimensional Conducting Polymer Counter Electrodes

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Three-dimensional (3D) Platinum-free (Pt-free) counter electrodes in dye-sensitized solar cells were constructed using poly(3,4-ethylenedioxythiophene) (PEDOT) as the conducting polymer. The 3D PEDOT film was synthesized by electrochemical polymerization (EP) of ethylenedioxythiophene (EDOT) monomer. The flat PEDOT film and thermally deposited Pt counter electrodes were prepared for comparison, respectively. The quasi-solid-state dye-sensitized solar cells (qssDSSCs) with nanogel electrolyte, showed 5.05 % power conversion efficiency (PCE), with 3D PEDOT counter electrode (EP 30 s). Comparing to the flat PEDOT (4.11 %) and thermally deposited Pt counter electrode (4.59 %), the 3D PEDOT film with 30 sec EP showed about 23 % and 10 % increase of efficiency, respectively. The improved performance of qssDSSCs with 3D PEDOT counter electrode would be attributed to its better catalytic performance and improved light reflecting ability. The 3D PEDOT counter electrodes were characterized with cyclic voltammogram (CV), incident photon-to-current efficiency (IPCE), and electrochemical impedance spectroscopy (EIS) analyses.