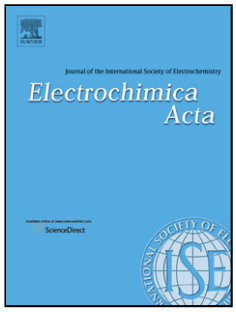

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Glucose aided synthesis of molybdenum sulfide/carbon nanotubes composites as counter electrode for high performance dye-sensitized solar cells

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Abstract: In our present study, the composites of molybdenum disulfide/carbon nanotubes (MoS_2/CNTs) were synthesized with glucose aided (G-A) by using an in situ hydrothermal route, and proposed as counter electrode (CE) catalyst in the dye-sensitized solar cells (DSSCs) for enhancing electrocatalytic activity toward the reduction of triiodide. The MoS_2/CNTs composites with tentacle-like structure were confirmed by using the scanning and transmission electron microscopy. The superior structural characteristics including large active surface area and particularly the unique tentacle-like nanostructure along with 3D large interconnected interstitial volume guaranteed fast mass transport for the electrolyte, and enabled the (G-A) MoS_2/CNTs CE to speed up the reduction of triiodide to iodide. The extensive electrochemical studies by the cyclic voltammetry, electrochemical impendence spectroscopy and Tafel measurements indicated that the (G-A) MoS_2/CNTs CE possessed superior electrocatalytic activity, great electrochemical stability and impressive low charge transfer resistance on the electrolyte|electrode interface (1.77 $\Omega \cdot cm^2$) in the triiodide/iodide system compared to the pristine MoS_2, MoS_2/C and sputtered Pt CEs. The DSSC assembled with the novel (G-A) MoS_2/CNTs CE exhibited high power conversion efficiency of 7.92% under the illumination of 100 $mW \cdot cm^{-2}$, comparable to that of the DSSC with the Pt electrode (7.11%).

Keywords: molybdenum sulfide; carbon nanotubes; glucose; counter electrode; dye-sensitized solar cell

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