Development of Mo-Compound/CNT-Graphene Composite Counter Electrodes for Efficient Quantum Dot-Sensitized Solar Cells

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We developed several Mo-compound/CNT-RGO composites as newly-designed catalytic electrodes for use in quantum dot-sensitized solar cells (QDSSCs). These electrode composites exhibited synergy between the intrinsically high electrocatalytic activity of the Mo-compounds, the large surface area, and the high electrical conductivity of the CNT-RGO supports. Mo_2N/CNT-RGO, Mo_2C/CNT-RGO, and MoS_2/CNT-RGO composites could be synthesized simply by controlling the precursors via the urea-glass route. XRD and TEM studies confirmed that the high-purity Mo-compounds were immobilized onto the CNT-RGO support, and the simultaneous reduction of GO occurred during the synthetic process. QDSSCs equipped with Mo_2N/CNT-RGO and Mo_2C/CNT-RGO counter electrodes exhibited enhanced photovoltaic performances and remarkable stabilities, both of which properties were superior to the corresponding properties of the MoS_2/CNT-RGO and even the reference Au counter electrode. The EIS and Tafel polarization analysis verified the excellent electrocatalytic activities of the Mo_2N/CNT-RGO and Mo_2C/CNT-RGO composites.