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Electrospinning in situ Synthesis of Graphene-Doped Copper Indium Disulfide Composite Nanofibers for Efficient Counter Electrode in Dye-Sensitized Solar Cells

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Abstract : In this paper, graphene-doped copper indium disulfide (rGO+CuInS2) composite nanofibers were fabricated via electrospinning, in situ synthesis, and carbonization, using polyvinyl pyrrolidone (PVP), copper dichloride (CuCl2), indium trichloride (InCl3), thiourea (C2H5NS) and graphene oxide nanosheets (Go) as the precursor solution for electrospinning. The average diameter of rGO+CuInS2 nanofibers were about 100 nm, and graphene nanosheets anchored with chalcopyrite CuInS2 nanocrystals 8-15 nm in diameter were overlapped and embedded, aligning along the fiber axial direction. The DSSC with a rGO+CuInS2 counter electrode exhibits a power conversion efficiency of 5.93%; better than the corresponding values for a DSSC with a CuInS2 counter electrode, and comparable to that of a reference DSSC with a Pt counter electrode. The excellent photoelectric performance of the rGO+CuInS2 counter electrode was attributed to its high specific surface area, which facilitated permeation of the liquid electrolytes, promoted electron and ion transfer and provided numerous catalytically active sites for the oxidation reaction of the electrolytic (I- /I3-).

Keywords : dye-sensitized solar cells, counter electrode, electrospinning, graphene
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