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Solar Photocatalytic Hydrogen Production from Glycerol Reforming Using Ternary Cu/TiO2/Graphene

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Abstract : A ternary Cu/TiO2/rGO photocatalysts was prepared using solvothermal method. Firstly, pure anatase TiO2 hollow spheres were prepared with titanium butoxide, ethanol, ammonium sulphate, and urea via hydrothermal method; and Cu nanoparticles were subsequently loaded on the surface of the hollow spheres by wet impregnation. During the solvothermal process, the deposition and well dispersion of Cu-TiO2 hollow spheres composites onto the graphene oxide surface, as well as the reduction of graphene oxide to graphene were achieved. The morphological and structural properties of the prepared samples were characterized by Brunauer-Emmett-Tellet (BET), X-ray Diffraction (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscopy (TEM), and UV-vis DRS, and photoelectrochemical. The activities of the prepared catalysts were tested for hydrogen production via simultaneous photocatalytic water-splitting and glycerol reforming under visible light irradiation. The excellent photocatalytic activity of the Cu-TiO2-hollow-spheres/rGO catalyst was attributed the rGO which acts as both storage and transferor of electrons generated at the Cu and TiO2 heterojunction, thus increasing the electron-hole pairs separation. This paper reports the preparation of photocatalyst which is highly active by coupling reduced graphene oxide with nano-structured TiO2 with high surface area that can efficiently harvest the visible light for effective water-splitting and glycerol photocatalytic reforming in order to achieve efficient hydrogen evolution.

Keywords : glycerol reforming, hydrogen evolution, graphene oxide, Cu/TiO2-hollow-spheres/rGO
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