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Copper Sulfide Nanodot Decorated TiO_2 Nanotube for Photocatalytic Hydrogen Generation from Water

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Hydrogen energy presents an ideal alternative to fossil fuels in the future because of its high energy capacity, environmental friendliness, and cost-effectiveness. To date, much attention has been devoted to one-dimensional (1D) semiconductor nanomaterials for hydrogen generation due to its stability, catalytic activity and simple fabrication. 1D semiconductor material such as TiO_2 nanotube (TNT) shows potential as a solar photocatalyst for hydrogen generation by its large surface area and superior charge transport property. However, some problems such as large band gap (3.3-3.8 eV) and high recombination rate of the photogenerated electron–hole pairs limits the solar application of TiO_2 as a photocatalyst. Particularly, sensitizer decoration offers an effective strategy to improve the activity of photocatalyst for solar application by extending the photo-response and promoting the separation of photogenerated electron-hole pairs. Recently, copper sulfide (Cu_xS, x is the undefined stoichiometric ratio) family has emerged as a class of effective sensitizers for semiconductor nanomaterials to improve hydrogen generation reaction. The Cu_xS family offers a wide spectrum of derivatives, which are attractive due to their wide absorption band and low reflectance in the visible range, making them promising candidates for solar energy-harvesting. The Cu_xS nanodots (NDs) attached TNTs are fabricated by wet chemistry technique at mild conditions. The morphologies, crystal phase, and optical properties as well as the photocatalytic behavior of the resulted Cu_xS/TNT are elaborately investigated. The results demonstrated that the Cu_xS ND/TNT offers a cost-effective and stable photocatalyst comparable with noble metal decorated TNT for efficient hydrogen generation from water.

Biography

Liu is now pursuing his PhD degree at the Department of Applied Biology and Chemical Technology, the Hong Kong Polytechnic University. He is involved in research projects related to photocatalysis, semiconductor nanomaterial and related characterizations, funded by University Grant Committee (UGC) of Hong Kong. He has published several research papers in international peer-reviewed journals such as *J. Phys. Chem. C, Electrochim. Acta, J. Chin. Polym. Sci., Sci. China Chem., Sci. Rep.,* etc.

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