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Original article

Fabrication of porous graphitic carbon nitride-titanium dioxide heterojunctions with enhanced photo-energy conversion activity

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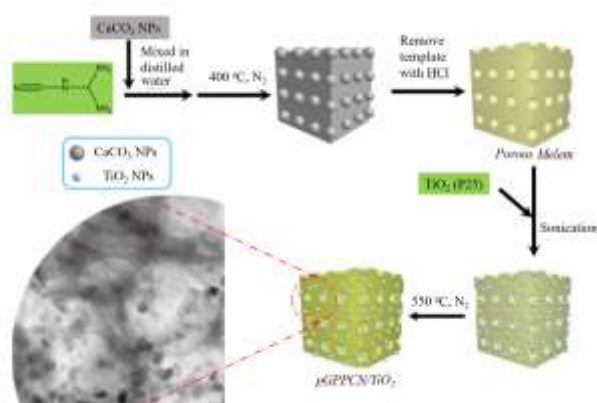
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Porous graphite-phase polymeric carbon nitride (GPPCN)/TiO₂ donor-acceptor heterojunction was facilely fabricated through the combination of a template technique with a co-calcination process, which exhibited much higher photoelectric activity compared to pristine carbon nitride and TiO₂.

Abstract

Porous graphite-phase polymeric carbon nitride (GPPCN)/TiO₂ donor-acceptor heterojunction was facilely fabricated through the combination of a template technique with a co-calcination process, which exhibited much higher photoelectric activity compared to pristine carbon nitride and TiO₂. The precursor of porous GPPCN (pGPPCN), porous melem, was prepared by using a green template, calcium carbonate, which could be easily removed by diluted hydrochloride. The pGPPCN/TiO₂ heterojunction was then obtained by the assembly and subsequent co-calcination of TiO₂ nanoparticles with porous melem. The formation of pGPPCN/TiO₂ donor-acceptor heterojunction prepared by this method showed improved surface area and light absorption. Moreover, the composite presented much higher photo-energy conversion activity than those of GPPCN, pGPPCN and TiO₂, which could be mainly ascribed to the high charge carrier separation efficiency. This study provides a new approach for the design and development of various photocatalysts with high efficiency for applications in energy fields.

Keywords:

Carbon nitride

TiO₂

Semiconductor

Photoelectrochemistry

Heterojunction

1. Introduction

The photoelectrochemical (PEC) activity of nanostructured semiconductors has been intensely studied in designing solar cells and optoelectronic devices for solar hydrogen production, environmental remediation and sensors[1-5]. Carbon nanomaterials are one of the most credible materials for solar cells since they capitalize on low-cost, high-efficiency and lightweight [6, 7]. However, the applications of graphene-based carbon nanomaterials are still limited due to the absence of an energy band gap. As a result, doping

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