Accepted Manuscript

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

Authors: Yan-Fei Shen, Cheng Zhang, Chun-Guang Yan, Hui-Qin Chen, Yuan-Jian Zhang

PII: S1001-8417(17)30132-8
DOI: http://dx.doi.org/doi:10.1016/j.cclet.2017.04.004
Reference: CCLET 4040

To appear in: *Chinese Chemical Letters*

Received date: 3-1-2017
Revised date: 21-2-2017
Accepted date: 4-4-2017

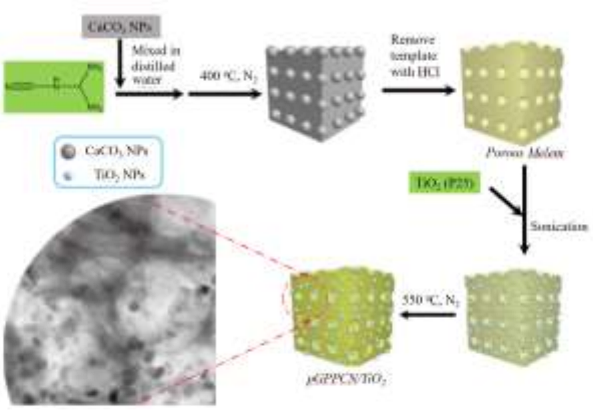
Original article

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

Yan-Fei Shen [a,*], Cheng Zhang [b], Chun-Guang Yan [a], Hui-Qin Chen [c], Yuan-Jian Zhang [b]

[a] *Medical School, Southeast University, Nanjing 210009, China*
[b] *School of Chemistry and Chemical Engineering, Southeast University, Nanjing 210098, China*
[c] *Department of Electronic Engineering, Southeast University Chengxian Colleage, Nanjing 210088, China*

∗ Corresponding author.
E-mail address: Yanfei.Shen@seu.edu.cn (Y.-F. Shen)



Porous graphite-phase polymeric carbon nitride (GPPCN)/TiO_2 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 TiO_2.

Abstract

Porous graphite-phase polymeric carbon nitride (GPPCN)/TiO_2 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 TiO_2. 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/TiO_2 heterojunction was then obtained by the assembly and subsequent co-calcination of TiO_2 nanoparticles with porous melem. The formation of pGPPCN/TiO_2 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 TiO_2, 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
TiO_2
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