Fabrication of g-C_3N_4/SnS_2/SnO_2 nanocomposites for promoting photocatalytic reduction of aqueous Cr(VI) under visible light

Yue Yang, Xin-An Yang, Di Leng, Shang-Bing Wang, Wang-Bing Zhang

PII: S1385-8947(17)31898-3
DOI: https://doi.org/10.1016/j.cej.2017.10.173
Reference: CEJ 17957

To appear in: *Chemical Engineering Journal*

Received Date: 20 July 2017
Revised Date: 10 October 2017
Accepted Date: 30 October 2017

Please cite this article as: Y. Yang, X-A. Yang, D. Leng, S-B. Wang, W-B. Zhang, Fabrication of g-C_3N_4/SnS_2/SnO_2 nanocomposites for promoting photocatalytic reduction of aqueous Cr(VI) under visible light, *Chemical Engineering Journal* (2017), doi: https://doi.org/10.1016/j.cej.2017.10.173

Fabrication of g-C_3N_4/SnS_2/SnO_2 nanocomposites for promoting photocatalytic reduction of aqueous Cr(VI) under visible light

*Yue Yang [a], Xin-An Yang [a], Di Leng [a], Shang-Bing Wang [b] and Wang-Bing Zhang [a] **

[a] Department of Applied Chemistry, Anhui University of Technology, Maanshan, Anhui 243002, P. R. China

[b] Analysis and Testing Central Facility, Anhui University of Technology, Maanshan, Anhui, 243002, P. R. China

ABSRTACT: A kind of g-C_3N_4/SnS_2/SnO_2 nanocomposite was firstly prepared by solvothermal method at 140°C for 4h after 30min ultrasonic irradiation. X-ray photoelectron spectroscopy (XPS), electron spin resonance (ESR), transmission electron microscopy (TEM) and electrical/optical testing techniques confirmed that the oxygen atoms in SnO_2 might be doped in the g-C_3N_4 in the synthesizing process, resulting to a good combination of SnS_2/SnO_2 nanosheets and g-C_3N_4 nanoparticles by Sn-O-C bond, which would have an influence on the light adsorption, carriers transfer, and electron-hole separation efficiency of g-C_3N_4/SnS_2/SnO_2. Additionally, the ultrasonic assisted solvothermal reaction could also promote the formation of oxygen vacancies on the surface of the material, which leads to the up-shift of valence band. The photocatalytic properties of the g-C_3N_4/SnS_2/SnO_2 were studied by the reduction of aqueous Cr(VI). The data clearly indicated that the photocatalytic activity of as-synthesized composites depends on their compositions, and reaction rate constant of Cr(VI) on the composite-C (with the mass ratio of 1:3) with visible light (λ>420 nm) driven can be improved 41.7- and 4.0-time compared with pure g-C_3N_4 and SnS_2/SnO_2, respectively. Additionally, more than 90% lost photocatalytic activity of composite-C can be regenerated by water-washing and drying treatment. The present study provided an efficient method for removing toxic Cr(VI) ions via photoreduction utilizing visible light irradiation (λ>420 nm).

Keywords: g-C_3N_4/SnS_2/SnO_2; ultrasonic irradiation; photocatalytic reduction; heavy metal ions; washing regeneration

*Corresponding author. Tel: +86 5552311807; fax: +86 5552311552

E-mail address: ahutwbzh@163.com (W. Zhang).