Chemical Engineering Journal 218 (2013) 73–80

Contents lists available at SciVerse ScienceDirect

Chemical Engineering Journal

journal homepage: www.elsevier.com/locate/cej

# Synthesis, characterization, and visible photocatalytic performance of $Zn_2GeO_4$ nanobelts modified by CdS quantum dots

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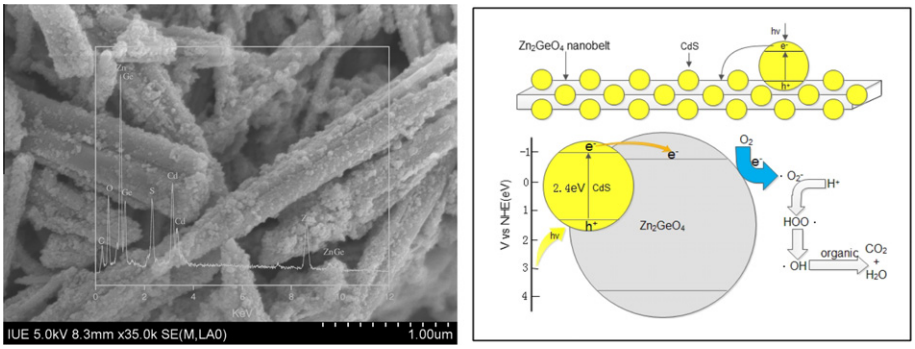
## HIGHLIGHTS

- The first example of quantum dots to sensitize the photocatalyst of $Zn_2GeO_4$.
- $Zn_2GeO_4$/CdS exhibited higher photocatalytic activity under visible light.
- The composite shows no obvious deactivation after three recycles experiments.

## GRAPHICAL ABSTRACT

$Zn_2GeO_4$ nanobelts modified by CdS quantum dots ($Zn_2GeO_4$/CdS) were prepared successfully by chemical bath deposition. The as-obtained samples demonstrated high photocatalytic performance to decolorize dye wastewater under visible light irradiation ($\lambda > 400$ nm).




## ARTICLE INFO

*Article history:*
Received 7 August 2012
Received in revised form 16 November 2012
Accepted 10 December 2012
Available online 19 December 2012

*Keywords:*
$Zn_2GeO_4$
CdS
Photocatalysis
Visible light
Rhodamine B

## ABSTRACT

$Zn_2GeO_4$ nanobelts modified by CdS quantum dots ($Zn_2GeO_4$/CdS) were prepared successfully by chemical bath deposition. The novel photocatalyst was characterized by X-ray diffraction, scanning electron microscopy, X-ray photoelectron spectroscopy and UV–Vis diffuse reflectance spectroscopy. It was found that $Zn_2GeO_4$/CdS consisted of uniform rhombohedral phase $Zn_2GeO_4$ nanobelts with highly dispersed cubic phase CdS quantum dots, and the $Zn_2GeO_4$/CdS exhibited strong visible light absorption at about 510 nm. The photocatalytic activities of the catalysts were evaluated by the discoloration of Rhodamine B under visible light illumination and were compared with that of pure $Zn_2GeO_4$ nanobelts. The results suggested that the composite photocatalyst had much higher photocatalytic activities than pure $Zn_2GeO_4$ nanobelts under irradiation of visible light. Meanwhile, no obvious deactivation of $Zn_2GeO_4$/CdS was observed after the three recycles experiments in photodegradation of RhB. The possible mechanism of visible light photocatalytic degradation is also proposed.



## 1. Introduction

For past decades, the research of various photocatalytic materials has attracted much attention due to their potential application in clean energy sources and degradation of environmental pollutants [1–3]. Currently, $TiO_2$ is undoubtedly the most widely used photocatalyst because of its biological and chemical stability, non-toxicity, cost effectiveness and high activity [4–6]. However, it still involved some disadvantages, such as limited activity and reduced sensitivity to the visible region of sunlight [7]. Therefore, recently new photocatalysts have been extremely explored that

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http://dx.doi.org/10.1016/j.cej.2012.12.031