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PII: S0025-5408(17)32759-9
DOI: https://doi.org/10.1016/j.materresbull.2017.10.014
Reference: MRB 9621

To appear in: *MRB*

Received date: 16-7-2017
Revised date: 9-10-2017
Accepted date: 9-10-2017

Please cite this article as: Kourosh Rahimi, Ahmad Yazdani, Mohammad Ahmadirad, Facile Preparation of Zinc Oxide Nanorods Surrounded by Graphene Quantum Dots Both Synthesized via Separate Pyrolysis Procedures for Photocatalyst Application, Materials Research Bulletin https://doi.org/10.1016/j.materresbull.2017.10.014

Facile Preparation of Zinc Oxide Nanorods Surrounded by Graphene Quantum Dots Both Synthesized via Separate Pyrolysis Procedures for Photocatalyst Application

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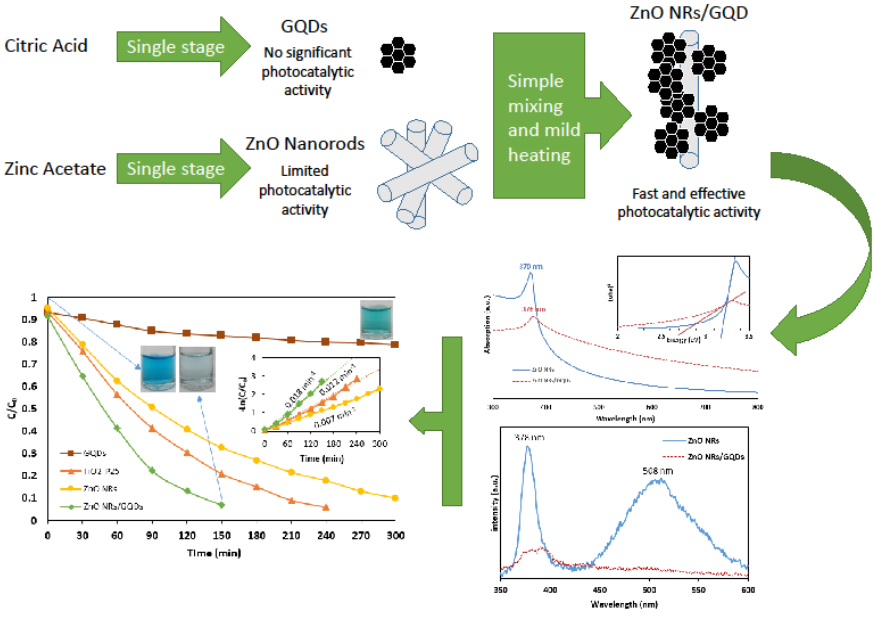
Highlights:

- ZnO NRs and GQDs were made separately via a simple and one-stage pyrolysis method.
- Because of the employed compositing method, GQDs compactly surrounded the ZnO NRs.
- Bandgap of ZnO NRs decreased from 3.2 to 2.8 eV after they were surrounded by GQDs.
- Despite being inefficient alone, GQDs largely enhanced ZnO photocatalytic activity.
- The mechanism was mainly attributed to the decrease in recombination rate of ZnO.

Graphical abstract



Abstract:

A facile pyrolysis method was employed for separate synthesis of zinc oxide nanorods (ZnO NRs) and graphene quantum dots (GQDs) and the structures were composited. The structures were characterized by field emission scanning electron microscopy (FE-SEM), transmission electron microscopy (TEM), X-ray diffractometry (XRD), and Fourier transform infrared (FTIR) spectroscopy. The structures were optically characterized by UV-visible and photoluminescence (PL) spectrometry techniques, showing that the absorption of ZnO NRs increases in the visible