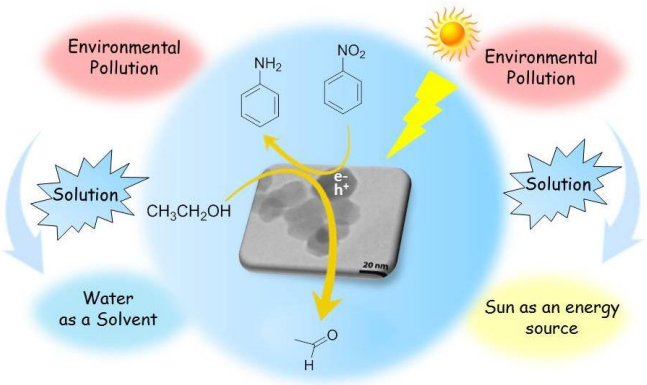
Green synthesis of CdS nanoparticles for reduction of nitrobenzenes to aminobenzenes using sunlight

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Abstract

Semiconductor nanoparticles have received much attention thanks to their applications in fluorescence probes for visualizing biological processes, magnetic resonance imaging agents for the diagnosis of many diseases and also catalysts in organic transformations or fuel cell. Among semiconductor nanoparticles, CdS is one of the first discovered semiconductors which has applications in various fields. On the other hand, sunlight is a green, cheap and renewable energy resource which can be used for photocatalysts to drive chemical transformations. The CdS has regarded as one of the most attractive visible light-driven photocatalysts thanks to its ability in harvesting visible light and a relatively narrow band gap energy (1-3). However, there are still challenges to further simplify the preparation of CdS nanoparticles with low cost and under environmental friendly conditions to use for organic transformations under sunlight for organic transformations (4). I report here a simple, practical, and novel preparation method for the preparation of CdS nanoparticles in water as an environmental friendly solvent. In this benchmark procedure, cadmium diethyl dithiophosphate has been used as a precursor for the synthesis of CdS nanoparticles using an easy hydrothermal method in water. The presented CdS nanoparticles are characterized by TEM, EDX, XRD, UV and fluorescence spectrometer. The results reveal that the prepared CdS nanoparticles have a hexagonal structure. Photocatalytic reduction activity studies show that the CdS nanoparticles have highly photocatalytic activity toward the reduction of nitrobenzenes to aminobenzenes using EtOH as a solvent under sunlight irradiation at room temperature. Reusability of prepared CdS nanoparticles is successfully examined for three times of photoactivity (5).

Image



Recent Publications

1. Li J-Y, Li Y-H, Qi M-Y, Lin Q, Tang Z-R, and Xu Y-J (2020) Selective organic transformations over cadmium sulfide-Based photocatalysts. ACS Catal. 10: 6262–6280.
2. Kaboudin B, Ghaderian A, (2013) A novel magneto-fluorescent microsphere: preparation and characterization of polystyrene-supported Fe_3O_4 and CdS nanoparticles. Applied surface science. 282: 396-399.
3. Kaboudin B, Kazemi F, Ghaderian A, Navidi E, Zand Z, (2013) A novel method for the synthesis of Fe_3O_4 nanoparticles/CdS nanowires heterostructure nanocomposite and uses in photodegradation of methylene blue. Journal of sulfur Chemistry. 3: 279-289.
4. Kandasamy K, Venkatesh M, Khadar Y.A. S, Rajasingh P, (2020) One-pot green synthesis of CdS quantum dots using Opuntia ficus-indica fruit sap. Materials Today: Proceedings. 26: 3503-3506.
5. Kaboudin B, Kazemi F, Ghaderian A, Zand Z, (2014) A novel and simple method for the preparation of hexagonal CdS nanoparticles: synthesis, characterization, and uses in photocatalytic reduction of nitrobenzenes to aminobenzenes using sunlight. J IRAN CHEM SOC. 11:1121–1127.



Biography

Dr. Abolfazl ghaderian has a great deal of different expertise in interdisciplinary projects. Hence, in his PhD and Master's research projects, he has worked on nanostructures, molecular catalysts, microstructures and polymers for chemical, electrochemical, photochemical and biological applications (such as water oxidation, reduction of nitrobenzene to aminobenzene by quantum dots, degradation of dyes, superoxide dismutase, and preparation magnetic nanoparticles for biological and catalytic application). He has graduated as an excellent Master student at IASBS in Iran and defended his PhD with Honor at ICIQ in Spain. He has a wide range of experimental skills in synthesis, catalysis, electrochemistry, photo conversion, clean energy, quantum dots, polymer, full cell, functionalization, composites.

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