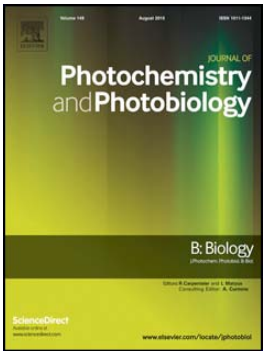

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Magnetic and photocatalytic studies on $Zn_{1-x}Mg_xFe_2O_4$ nanocolloids synthesized by solvothermal reflux method

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Abstract

Biocompatible magnetic semiconductor $Zn_{1-x}Mg_xFe_2O_4$ (x = 0, 0.1, 0.3, 0.5 & 0.7) nanoparticles of around 10 nm diameter were synthesized by solvothermal reflux method. The method produces well separated and narrow size distributed nanoparticles. Crystal structure, morphology, particles surface properties, surfactant quantity, colloidal stability, magnetic properties and photocatalytic properties of the synthesized nanoparticles were studied. Different characterizations confirmed that all compounds were single crystals and superparamagnetic at room temperature. Saturation mass magnetization (M_s = 57.5 emu/g) enhances with substituent Mg^{2+} concentration due to promotion of mixed spinel (normal and inverse) structure. Photocatalytic activity of all synthesized magnetic semiconductor nanoparticles were studied through methylene blue degradation. The degradation of 98% methylene blue was observed on 60 min irradiation of light. It is observed that photocatalytic activity slightly enhances with substituent Mg^{2+} concentration. The synthesized biocompatible magnetic semiconductor nanoparticles can be utilized as photocatalysts and could also be recycled and separated by applying an external magnetic field.

Keywords: Magnetic semiconductor, superparamagnetic nanoparticles, photocatalyst, solvothermal reflux method.

1. Introduction

Spinel ferrites were used in wide range of applications such as soft magnets, hard magnets, data storage devices, magnetic hyperthermia, water treatment, catalysis, gas sensors, magnetic drug delivery, magnetic resonance imaging (MRI) contrast agents, dielectric devices, etc., [1]. Nanocrystalline spinel ferrites were shown enhanced gas sensing, biomedical, catalysis, adsorption, membrane filtration properties due to high surface area per unit volume of material. Among all properties, catalysis is widely used in environmental research and

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