

عنوان مقاله:

Synthesis and characterization ZnFe₂O₄@MnO and MnFe₂O₄@ZnO magnetic nanocomposites: Investigation of photocatalytic activity for the degradation of Congo Red under visible light irradiation

محل انتشار:

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خلاصه مقاله:

In the present investigation, ZnFe₂O₄@MnO and MnFe₂O₄@ZnO magnetic nanocomposites were fabricated via a facile hydrothermal method and were calcined at ۳۰۰ °C for ۳ h. Synthesis of ZnFe₂O₄@MnO and MnFe₂O₄@ZnO magnetic nanocomposites optimized by the different weight percentages. The synthesized photocatalyst was characterized by X-ray diffraction (XRD), Fourier transform infrared (FT-IR), Vibrating Sample Magnetometer (VSM), EDAX (Energy dispersive X-ray Analysis), diffuse reflectance UV-vis spectroscopy (DRS) and field emission scanning electron microscopy (FESEM). The ZnFe₂O₄@MnO nanoparticles were found to have ۲۰-۵۰ nm. Magnetic studies revealed that the ZnFe₂O₄@MnO and MnFe₂O₄@ZnO nanocomposites can be easily separated from the solution by an external magnetic field. The photocatalytic degradation of Congo red dye (CR) was investigated based on the removal of Congo red (CR) in aqueous solution in ۳۵ min of visible light irradiation. Compared with MnFe₂O₄@ZnO nanocomposite, the ZnFe₂O₄@MnO nanocomposite showed high photocatalytic performance on the photodegradation of Congo red. Effect of reaction time, pH, and loading of ZnO on degradation of CR was studied, The results demonstrated that the degradation efficiency of ZnFe₂O₄@MnO nanocomposite (۹۸.۵%) was better than that of MnFe₂O₄@ZnO nanocomposite (۹۰.۳۲%), which is due to the presence of narrow band gap energy of ZnFe₂O₄@MnO. Kinetics studies have displayed that the degradation of CR by the prepared photocatalysts follows the pseudo-first-order kinetics and the rate constant achieved for ZnFe₂O₄@MnO ($k=۰.۰۳۷۱ \text{ min}^{-1}$) was much greater than of MnFe₂O₄@ZnO ($k=۰.۰۳۲۱ \text{ min}^{-1}$). The synthesized ZnFe₂O₄@MnO nanocomposite can be potentially applied as a magnetically separable photocatalyst to deal with water pollution problems.

کلمات کلیدی:

Congo Red, Hydrothermal Method, Magnetical Nanocomposites, Photocatalytic Activity, Visible Light

