

عنوان مقاله:

Magnetic nano-biocomposite CuFe₂O₄@methylcellulose (MC) prepared as a new nano-photocatalyst for degradation of ciprofloxacin from aqueous solution

محل انتشار:

مجله مدیریت ومهندسی بهداشت محیط, دوره 6, شماره 1 (سال: 1398)

تعداد صفحات اصل مقاله: 11

نویسندگان:

Alireza Nasiri - *Department of Chemistry, Islamic Azad University, Yazd Branch, Yazd, Iran*

Ali Asadipour - *Environmental Health Engineering Research Center, Kerman University of Medical Sciences, Kerman, Iran*

Fatemeh Tamaddon - *Department of Chemistry, Yazd University, Yazd ۸۹۱۹۵-۷۴۱, Iran*

Majid Amiri Gharaghani - *Department of Environmental Health Engineering, Sirjan Faculty of Medical Science, Sirjan, Iran*

خلاصه مقاله:

Background: Antibiotics such as ciprofloxacin (CIP) are even more important in bacterial resistance, even at low concentrations. The aim of this research was to synthesize CuFe₂O₄@methylcellulose (MC) as a new nano-photocatalyst for degradation of CIP from aqueous solution. Methods: The nano-photocatalyst (CuFe₂O₄@MC) was characterized by FESEM, energy dispersive spectroscopy (EDS), X-ray diffraction (XRD) and Fourier transform infrared (FTIR), thermogravimetric analysis (TGA), and vibrating sample magnetometer (VSM). Powder XRD and EDS analysis confirmed the formation of pure-phase spinel ferrites. After CuFe₂O₄@MC characterization, the effective parameters in removal efficiency of CIP such as reaction time, initial antibiotic concentration, pH, photocatalyst loading, and degradation kinetic were investigated and conditions were optimized. Then, CIP degradation experiments were conducted on the real sample in the optimal conditions. The removal of chemical oxygen demand (COD) was determined under optimum conditions. Results: The structural characterization of the magnetic nanobiocomposite showed that it is in nanoscale, ferromagnetic property, and thermal stability. The optimal conditions were obtained at pH = 7, irradiation time (90 minutes), photocatalyst loading (0.2 g), and initial concentration of CIP (3 mg/L). The removal efficiency of CIP in the optimal conditions was obtained as 80.74% and 72.87% from the synthetic and real samples, respectively. The removal of COD was obtained as 68.26% in this process. The evaluation of kinetic linear models showed that the photocatalytic degradation process was fitted by pseudo-first order kinetic model and Langmuir-Hinshelwood. CuFe₂O₄@MC photocatalyst had a good stability and reusability for the fourth runs. Conclusion: The photocatalytic degradation of CIP from aqueous media with CuFe₂O₄@MC photocatalyst has a high efficiency, which can be used in the treatment of pharmaceutical wastewaters.

کلمات کلیدی:

Spinel, Ciprofloxacin, Methylcellulose, Wastewater

