

عنوان مقاله:

Synthesis of a new hybrid material based on Cr_2O_3 nanoparticles encapsulating phosphotungstic acid as an efficient photocatalyst to degrade a synthetic opioid: Methadone

محل انتشار:

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تعداد صفحات اصل مقاله: 8

نویسندگان:

Farshid Kazemi - Department of Applied Chemistry, Mashhad Branch, Islamic Azad University, Mashhad, Iran

Hasan Ali Zamani - Department of Applied Chemistry, Mashhad Branch, Islamic Azad University, Mashhad, Iran

Mohamad Reza Abedi - Department of Applied Chemistry, Quchan Branch, Islamic Azad University, Quchan, Iran

Mahmoud Ebrahimi - Department of Applied Chemistry, Mashhad Branch, Islamic Azad University, Mashhad, Iran

خلاصه مقاله:

Methadone is a synthetic drug utilized to manage chronic pain and treat opioid maintenance. The drug enters water bodies as a contaminant due to its widespread use in various communities, which is usually not removed by wastewater treatment plants. Therefore, a photodegradation procedure was developed to degrade and remove methadone in water samples. A hydrothermal strategy was applied to prepare three photocatalysts based on Cr_2O_3 nanoparticles, a polyoxometalate (phosphotungstic acid), and a hybrid material (Cr_2O_3 nanoparticles encapsulating phosphotungstic acid). The effective factors, such as methadone concentration, pH, photocatalyst amount, and H_2O_2 concentration, in the photodegradation method for each catalyst were optimized by an experimental design using a central composite design. Under the optimum conditions, the kinetic model and maximum photodegradation efficiency of the process for each catalyst were studied to compare their ability for methadone degradation. The maximum photodegradation efficiencies for methadone degradation using phosphotungstic acid and Cr_2O_3 nanoparticles were 82.00 and 77.18% for 120 min. In comparison, the maximum photodegradation efficiency in the presence of Cr_2O_3 nanoparticles encapsulating phosphotungstic acid was 90.11% for 100 min. The results indicated the new hybrid material prepared from encapsulating phosphotungstic acid with Cr_2O_3 nanoparticles, leading to a proper increase in the methadone degradation and reducing the degradation time significantly.

کلمات کلیدی:

Methadone, Cr_2O_3 , Hydrothermal Synthesis, Hybrid material

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