

عنوان مقاله:

Sonocatalytic degradation of organic dye pollutants from aqueous solutions using MIL-101 (Cr)/CuO/MgFe₂O₄ heterojunction nanocatalyst

محل انتشار:

هشتمین کنفرانس بین المللی شیمی، مهندسی شیمی و نفت (سال: 1399)

تعداد صفحات اصل مقاله: 8

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خلاصه مقاله:

In this study, a novel magnetic MIL-101(Cr)/CuO/MgFe₂O₄ nanocomposite catalyst was successfully fabricated by the hydrothermal route for the sonodegradation of organic dye pollutants from aqueous solutions. The structural, morphological and magnetic features of the nanocomposite were characterized by means of XRD, FESEM, EDS, VSM and BET analyses. To investigate the sonocatalytic performance of the as-manufactured MIL-101(Cr)/CuO/MgFe₂O₄ nanocomposite, the H₂O₂-assisted degradation of organic dyes like methylene blue (MB), Rhodamine B (RhB) and methyl orange (MO) in aqueous solution were studied under ultrasound irradiation. The gained results illustrated that the ternary MIL-101(Cr)/CuO/MgFe₂O₄ nanocomposite had better activity for sonodegradation of these dyes than MIL-101(Cr)/MgFe₂O₄, bare MIL-101(Cr), CuO or MgFe₂O₄. The enhanced sonocatalytic activity of the synthesized nanocomposite could be related to the fast generation and separation of electrons and holes in MgFe₂O₄, CuO and MIL-101(Cr). Plus, the relatively high specific surface area of the MIL-101(Cr)/CuO/MgFe₂O₄ and magnetic feature of MgFe₂O₄ improve the degradation yield of the organic dyes. The separation of the magnetic sonocatalyst from aqueous solutions could be easily achieved applying an external magnetic field. The several parameters on the sonocatalytic activity, including irradiation time, dye type, catalyst amount and initial dye concentration were also evaluated. The trapping experiments displayed that .OH free radicals are the significant reactive species in the dye degradation. Additionally, the recyclability experiment, was also implemented to ensure the stability of the used sonocatalyst.

کلمات کلیدی:

MIL-101 (Cr)/CuO/MgFe₂O₄, nanocomposite, sonocatalyst, organic dyes

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