EFFECTIVE TREATMENT OF HOSPITAL WASTEWATER WITH HIGH-CONCENTRATION DICLOFENAC AND IBUPROFEN USING A PROMISING TECHNOLOGY BASED ON DEGRADATION REACTION CATALYZED BY FE0 UNDER MICROWAVE IRRADIATION

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Abstract

Real hospital wastewater was effectively treated by a promising technology based on degradation reaction catalyzed by Fe0 under microwave irradiation in this work. Fe0 powders were synthesized and characterized by different techniques, resulting in a single-phase sample with spherical particles. Optimum experimental conditions were determined by a central composite rotatable design combined with a response surface methodology, resulting in 96.8% of chemical oxygen demand reduction and 100% organic carbon removal, after applying MW power of 780 W and Fe0 dosage of 0.36 g L⁻¹ for 60 min. Amongst the several organic compounds identified in the wastewater sample, diclofenac and ibuprofen were present in higher concentrations; therefore, they were set as target pollutants. Both compounds were completely degraded in 35 min of reaction time. Their plausible degradation pathways were investigated and proposed. Overall, the method developed in this work effectively removed high concentrations of pharmaceuticals in hospital wastewater.

Keywords

Hospital wastewater; Ibuprofen; Diclofenac; Degradation; Microwave; Zero-valent iron