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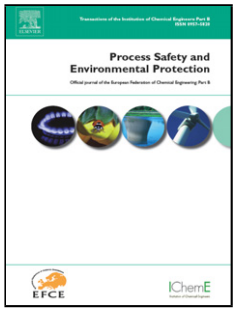

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Sonophotocatalytic Degradation of Textile dyes over Cu impregnated ZnO catalyst in Aqueous Solution

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Highlights

•Ultrasonic wave combined with visible light and photocatalyst (Cu-ZnO) used as efficient technique for BV-1 and BG-4 dyes removal.

•The optimized pH was found to be 10.

•The photocatalytic degradation of dyes increased with synergistic effect of ultrasonic waves.

Abstract

To increase the performance of ZnO from UV to visible light, ZnO particles were impregnated with copper (Cu) using wet impregnation method. The synthesized impregnated ZnO was characterized by X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive X-ray analysis (EDX), Fourier transformed infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS). The degradation of dyes with sonophotocatalytic process was high as compared to photocatalytic and sonocatalytic. The effects of the copper impregnated ZnO (Cu-ZnO) catalyst on the degradation of two textile dyes were investigated using the parameters like pH, catalyst dose, radical enhancer, radicle scavenger and initial dye concentration. The addition of radical enhancer (H_2O_2) increased the degradation efficiency from 35% to 95% at pH 10. At optimum conditions, maximum degradation of dyes were 100% in 20 min using sonophotacatalytic degradation as compared to photocatalytic process the degradation efficiency was 95-98% in 60 min. With the addition of carbonate, sulphate and chloride as radicle scavengers, the degradation efficiency decreased from 100% to 92%, 94% and 92% with 0.025 M concentration of each scavenger, respectively. The degradation efficiency decreased only 5% after repeated use of Cu-ZnO

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