Degradation of phenol by visible light assisted electrocatalytic treatment using N-V co-doped TiO₂ as photocatalyst and response surface methodology

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In this study, simulated phenolic wastewater was treated by visible-light-assisted electrocatalysis using γ -Al₂O₃-supported N-V co-doped TiO₂ nanocatalysts as particle electrodes. The Box-Behnken design response surface method was utilized to study the factors affecting the degradation of phenol wastewater by visible light assisted electrocatalytic treatment and the interaction between these factors. The influence of the factors on the phenol removal rate decreases in the following order: pH > distance between electrodes > electrolyte concentration. The influence of the interaction among the factors on the phenol removal rate decreases in the following order: pH and electrolyte concentration > pH and distance between electrodes > distance between electrodes and electrolyte concentration. The optimized conditions are as follows: a phenol concentration of 180 mg/L, a COD of 387.5 mg/L, a pH of 2.82, an distance between electrodes of 11.00 cm and an electrolyte concentration of 0.96 mg/L, corresponding to an optimal COD removal rate of 81.86%. Visible-light-assisted multiphase electrocatalysis has an outstanding effect on the treatment of simulated phenolic wastewater.

Keywords: Response Surface Methodology; Visible light; Photoelectricity; Phenol

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