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Kinetic Study of Heterogeneous Photocatalysis of Tartrazine in Different Conditions of pH and $CoFe_2O_4$ Concentration

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Highlights

The handling of tartrazine was significantly influenced by the pH and concentration of the subject. The photocatalytic process with $CoFe_2O_4$ shows promising potential for treating azo dyes. Best removal observed in acidic media, with efficiency above 74% at pH 3.6.

Resumo/Abstract

The degradation of tartrazine (50 mg L^{-1}) was investigated by heterogeneous photocatalysis using cobalt ferrite ($CoFe_2O_4$) synthesized by coprecipitation. The experimental conditions were optimized using a 2^2 factorial design, varying the pH (3.5–10.2) and catalyst concentration (0.5–1.5 g L^{-1}), under visible light irradiation. Spectrophotometric monitoring in the 430 and 260 nm regions revealed a strong influence of pH, with 74% removal in acidic media (pH ≈ 3.6). The kinetic analysis indicated that the process follows a pseudo-first order model, with apparent speed constant k = 0.0432 min^{-1} and correlation coefficient R^2 = 0.9256, showing rapid initial degradation. The results demonstrate the high potential of $CoFe_2O_4$ as an efficient photocatalyst for the removal of azo dyes under visible light, highlighting the effectiveness of factorial design in identifying optimal conditions and confirming that the reaction mechanism obeys pseudo-first order kinetics.

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