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Photodegradation of Acid Black 210 Dye in Aqueous Solution Using Potassium Persulfate

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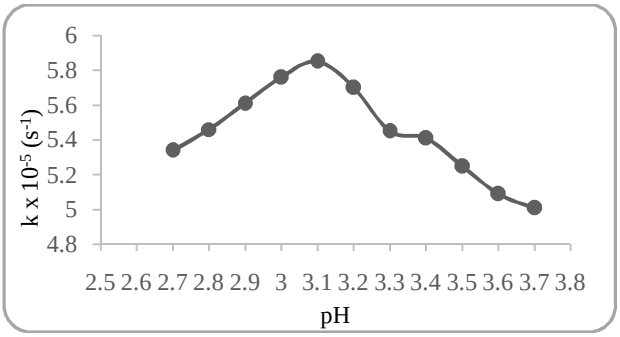
ABSTRACT

The degradation of synthetic azo dyes is a pressing environmental concern due to their widespread use and persistence in water bodies. This study investigates the dynamic changes in optical density and absorbance over time at λ_{max} 630 nm in an experiment involving Acid Black 210. The initial high absorbance and optical density gradually decrease over time, indicating a first-order reaction with a rate constant of 5.85 x 10^{-5} s^{-1}. Further analyses explore the influence of pH, dye concentration, potassium persulfate concentration, and light intensity on the rate constant and absorbance. At optimal pH 3.1, the dye exhibits maximum absorbance, suggesting ionization-induced structural changes. Dye concentration positively correlates with absorbance and the rate constant, indicating more effective light absorption and concentration-dependent kinetics. Similarly, increasing potassium persulfate concentration and light intensity enhance absorbance, implying the concentration-dependent formation of reaction products or intermediates. By elucidating the photodegradation mechanisms and optimizing reaction conditions, we aim to develop an efficient and environmentally friendly method for the remediation of wastewater contaminated with Acid Black 210.

Graphical Abstract:



Effect of pH for acid black 210.

Keywords: Degradation of dye, Photochemical reaction optimization, Absorbance, Wastewater treatment, Azo dye