

Comparison between coagulation and electrocoagulation processes for the removal of reactive black dye RB-5 and COD reduction

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ABSTRACT

This study examined the possibility of removing reactive black-5 (RB-5) dye and chemical oxygen demand (COD) from simulated wastewater using chemical coagulation technique, in comparison with electrocoagulation technique. Ferric sulfate $Fe_2(SO_4)_3$, ferrous sulfate (FeSO₄), ferric chloride (FeCl₃), polyaluminum chloride (PACl) and alum (Al₂SO₄·5H₂O) were used as coagulants. Optimum pH, coagulant dosages, and initial concentration were determined by jar tests, and the maximum dye and COD removal were obtained. The maximum removal efficiency was found to be 98% and 90% for dye and COD, respectively, where the best coagulant was $Fe_2(SO_4)_3$ at optimum pH and dosage of 4,200 mg/L. On the other hand, the electrochemical cell was designed using aluminum plates as the anode and cathode with dimensions of (7 cm³ × 4 cm³ × 0.3 cm³). Many experimental runs were done at a different operating condition (pH, NaCl concentration, initial concentration, and electrical supply voltage) to study the removal performance of electrocoagulation for RB-5 dye and COD removal. The results indicated that at an optimum pH of 2 and NaCl concentration 1,000 mg/L the maximum removal was 100% and 93% for dye and COD, respectively. The study proved that the percentage removal of RB-5 and COD better by electrochemical than by chemical coagulation.

Keywords: Chemical coagulation; Fe₂(SO₄)₃; Electrocoagulation; NaCl; Reactive black-5 (RB-5); Chemical oxygen demand (COD)

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