

Comparative Study of Chemical Coagulation and Electrical Coagulation for Wastewater Treatment

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Abstract: The increasing discharge of industrial wastewater containing high levels of organic, inorganic, and suspended impurities poses a serious threat to the environment and public health. This project presents a comparative study of Chemical Coagulation (CC) and Electrocoagulation (EC) as two effective physicochemical methods for wastewater treatment. In the Chemical Coagulation process, Ferrous Sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) was used as a coagulant at varying dosages and pH conditions, while the Electrocoagulation process utilized iron electrodes under controlled electrical conditions. The performance of both methods was evaluated based on pH, BOD, COD, turbidity, and sludge formation. Results indicated that EC achieved greater removal efficiency ($\approx 60 - 65\%$ COD and 65% BOD reduction) with less sludge generation compared to CC ($\approx 40 - 45\%$ COD reduction). Although the initial cost of EC setup was higher, its operational efficiency, lower sludge handling cost, and eco-friendly nature make it a more sustainable choice for industrial wastewater treatment. This study highlights the potential of EC as a superior alternative to conventional chemical coagulation methods.

Keywords: Wastewater treatment, Chemical coagulation, Electrocoagulation, Ferrous sulphate, Iron electrodes, BOD, COD, pH, Sludge reduction, Cost analysis, Industrial effluent.

