FEASIBILITY STUDY OF ELECTROCOAGULATION WITH VIBRATION-INDUCED ELECTRODE PLATES IN REMOVAL OF COLOUR FROM DYE WASTEWATER

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ABSTRACT

Presently, dyes wastewater from the textile industries has become one of the contributors to the world's main environmental concern in waste generation. This paper presents the study of the feasibility of electrocoagulation (EC) with vibration-induced electrode plates in the removal of colour from dye wastewater by determining the optimum concentration of synthetic dye of Methylene Blue (MB), the effect of pH at varied vibration and current intensity, and operating time and lastly, the kinetic study of EC. It is significance to study the vibration-induced plates on the EC as to improve the old approach of stirring, such as the magnetic stirrer, in the dye wastewater treatment. The vibration-induced plates method has been found to increase the rate of coagulant ion transport during treatment by creating a stirring effect around the electrode plate surface, resulting in the removal of colour from dye waste. In this study, the aluminium electrodes were used to treat synthetic dyes of MB and the dye preparation were conducted in the lab by varying the concentration from 5 to 25 PPM. After the optimum concentration was determined, the concentration then was used to investigate the effects of pH for both acid and base on the removal of colour from dye waste at varied vibration intensity, current intensity and operating time together with the kinetic study of EC. The result showed that the highest total colour removal percentage, 74.76%, was at a pH of 9.0 with vibration and current intensity of 2.5 V and 2.5 A, respectively. As for the kinetic study of EC, the rate obtained for the highest R^2 value is the first order reaction. The rate constant obtained was 0.0037 min^{-1} at acidic pH and 0.0022 min^{-1} at alkaline pH. Overall, the vibration-induced electrode plates enhanced treatment efficiency by allowing bubbles to separate from the electrode surface and disperse in the solution in alkaline solution. The removal of bubbles from the plates enhanced mixing in the solution, resulting in greater separation after treatment at optimum vibration intensity. Finally, this research proved that EC using vibration-induced electrode plates may be used to remove dye from wastewater.