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Treatment of Healthcare Wastewater Using The Peroxi-Photoelectrocoagulation Process: Predictive Models for Chemical Oxygen Demand, Color Removal, and Electrical Energy Consumption

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Abstract : The peroxi-photoelectrocoagulation process was evaluated for the removal of chemical oxygen demand (COD) and color from healthcare wastewater. A 2-level full factorial design with center points was created to investigate the effect of the process parameters, i.e., initial COD, H_2O_2, pH, reaction time and current density. Furthermore, the total energy consumption and average current efficiency in the system were evaluated. Predictive models for % COD, % color removal and energy consumption were obtained. The initial COD and pH were found to be the most significant variables in the reduction of COD and color in peroxi-photoelectrocoagulation process. Hydrogen peroxide only has a significant effect on the treated wastewater when combined with other input variables in the process like pH, reaction time and current density. In the peroxi-photoelectrocoagulation process, current density appears not as a single effect but rather as an interaction effect with H_2O_2 in reducing COD and color. Lower energy expenditure was observed at higher initial COD, shorter reaction time and lower current density. The average current efficiency was found as low as 13 % and as high as 777 %. Overall, the study showed that hybrid electrochemical oxidation can be applied effectively and efficiently for the removal of pollutants from healthcare wastewater.

Keywords : electrochemical oxidation, UV, healthcare pollutants removals, factorial design
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