DEVELOPMENT OF FREUNDLICH BASED MODEL FOR FLUORIDE REMOVAL VIA ELECTROCOAGULATION PROCESS USING ALUMINIUM ELECTRODES

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AUTHOR'S DECLARATION

I declare that the work in the thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own, unless otherwise indicated or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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SUPERVISOR'S CERTIFICATION

We declared that we read this thesis and in our point of view this thesis is qualified in terms of scope and quality for the purpose of awarding the Bachelor of Chemical Engineering (Environment) with Honours.

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ABSTRACT

Fluoride is one of the major concerns in industrial wastewater especially for semiconductor industry. The conventional techniques of fluoride removal such as chemical precipitation requires large amount of chemical to treat the fluoride wastewater which leads to large sludge production. Alternatively, electrocoagulation (EC) process has been developed to improve fluoride removal efficiency and to overcome the problems arise from the conventional techniques. EC is a promising technology that extensively used to remove fluoride ions efficiently from industrial wastewater. However, it has receive very little consideration and understanding on mechanism and factors that affecting the fluoride removal process. In order to determine the efficiency of fluoride removal in EC process, the effect of operating parameters such as voltage and electrolysis time was investigated in this study. A batch experiment with monopolar aluminium electrodes was conducted to identify the model of fluoride removal using Freundlich based equation. The electrocoagulation process was investigated for several parameters which include voltage (3 – 12 V) and electrolysis time (60 minutes). The result shows that the fluoride removal efficiency increases steadily with increasing voltage and electrolysis time. However, when the initial fluoride concentration is increases, the fluoride removal efficiency will be decreases due to insufficient amount of coagulant ions produced. The best fluoride removal efficiency was obtained with 94.8 % removal for 25 mg/L initial fluoride concentration, voltage of 12 V and 60 minute electrolysis time. The results indicated that the rate constant K and number of order n, decreases as the voltage increase. The fluoride removal model was developed based on the Freundlich equation using the correlation of K and n. Overall, the result showed that electrocoagulation process can be considered as a potential alternative technology for fluoride removal in wastewater.