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Removal of chromium(III) from tannery wastewater by electrochemical peroxidation process in a bench scale reactor

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ABSTRACT

Chromium(III) used in tanning process is not consumed fully and around 30–40% of Chromium(III) is washed away to the environment causing severe environmental problem especially to the aquatic system. To remove Chromium(III) from wastewater, many different treatment techniques have been developed. This study deals with the ability of electrochemical peroxidation process for the removal of Chromium(III) from tannery wastewater in a batch stirred tank bench scale reactor with hopper bottom of 5 L working volume equipped with two iron electrodes which were investigated. The removal percentage of chromium was determined by varying operating parameters such as pH = 2–8, Fe^{2+} = 2–5 mg/L, H_2O_2 = 5–20 mg/L and current density = 10–40 mA/cm² were studied. The results showed that the Chromium(III) removal efficiency of 87% was achieved under optimum condition such as pH = 2, Fe^{2+} = 2 mg/L H_2O_2 = 15 mg/L, current density = 30 mA/cm² and contact time was 120 min with an electrical energy consumption of 0.073 kWh/L. The operating costs for the removal of Chromium(III) was found to be 0.4 $/m³ for treated tannery wastewater. The electrochemical peroxidation process proved to be an efficient and appropriate technique for the removal of Chromium(III) from tannery wastewater.

Keywords: Electrochemical peroxidation process; Tannery wastewater; Chromium(III); Iron electrodes

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