



Electrochemical destruction of polyvinyl alcohol mediated by electrogenerated Ce(IV) in aqueous solution

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ABSTRACT

This study investigated the electrogeneration of Ce(IV) and its application on the destruction of polyvinyl alcohol (PVA) in an undivided electrochemical cell. The effects of electric current, concentration of nitric acid, and temperature on PVA destruction efficiency were investigated and the corresponding specific energy consumptions (SEC) were also evaluated. The experimental results indicate that the PVA destruction increased with increasing the applied current, the concentration of nitric acid, and decreasing the temperature. When considering the PVA destruction efficiency and the corresponding SEC simultaneously, the best operating condition was found by 92% at the optimal applied current 0.1 A, concentration of nitric acid 0.5 M, and temperature 323 K, respectively. A pseudo-first-order kinetic model provided a good fit to the experimental results at various temperatures. The activation energy was calculated to be 78.27 kJ mol⁻¹, based on pseudo-first-order rate constants from the Arrhenius equation.

Keywords: Mediated electrochemical oxidation (MEO); Polyvinyl alcohol (PVA); Specific energy consumption (SEC); Activation energy

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