Degradation of 2,4-Dichlorobenzoic Acid by Coupled Electrocatalytic Reduction and Anodic Oxidation

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Dual effects of cathodic dechlorination and oxidative decomposition of 2,4-dichlorobenzoic acid (2,4-DCBA) can be achieved using electrochemical reduction-oxidation technology. The removal efficiency was improved by optimizing the experimental conditions affecting electrode activity and contaminant degradation. The 2,4-DCBA removal efficiency reached 90.8% at a current density at $50 \text{ mA} \cdot \text{cm}^{-2}$, initial pH of 5, and sodium sulfate concentration of $0.05 \text{ mol} \cdot \text{L}^{-1}$, with a 2,4-DCBA concentration of $20 \text{ mg} \cdot \text{L}^{-1}$. Furthermore, a good total organic carbon removal efficiency of 81.6% was achieved in the electrocatalytic reduction and oxidation process, with the present system retaining high stability after many experiment cycles. The reaction mechanism under different conditions is discussed, which provides new approaches to the degradation of chlorinated organic compounds.

Keywords: 2,4-dichlorobenzoic acid, electrochemical reduction-oxidation, optimal conditions, dechlorination, oxidation reaction

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