

The influence of cathode material on electrochemical degradation of trichloroethylene in aqueous solution

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The influence of cathode material on trichloroethylene (TCE) transformation in aqueous solution was tested by an electrochemical flow-through reactor. The efficiencies of TCE degradation by Fe, Cu, and Ni foam cathode were 43.5%, 56.2%, and 68.4%, respectively. The normalized pseudo-first-order rate coefficients, k_{sv} ($L\ m^{-2}\ min^{-1}$) were 1.13×10^{-4} , 1.16×10^{-4} , and 1.58×10^{-4} for Fe, Cu and Ni foam cathode, respectively. The electroreduction via hydrodechlorination (HDC) mechanism involves the reaction of the substance with atomic hydrogen which forms at the cathode surface. Under the tested conditions, the cathodes order of reactivity ($Fe < Cu < Ni$) is in agreement with electrodes electrocatalytic activity on hydrogen formation. TCE overall removal efficacies achieved with the palladized Fe, Cu, and Ni foam cathodes ($0.76\ mgPd\ cm^{-2}$ geometric area) were 99.8%, 79.6%, and 78.4%, respectively. Normalized pseudo-first-order rate coefficients, k_{sv} ($L\ m^{-2}\ min^{-1}$) were 7.63×10^{-4} , 3.73×10^{-4} , and 2.51×10^{-4} for palladized Fe, Cu and Ni foam cathode, respectively. This implies that palladium coating on the cathodes significantly improves their performance on TCE degradation. The results indicate that cathode material significantly influences TCE degradation efficiency and rate.