Applications of electrochemical ferrate(VI) for degradation of trichloroethylene in the aqueous phase

Joo-Hee Nam\textsuperscript{a}, Il-Kyu Kim\textsuperscript{a}, Jaehyun Kwon\textsuperscript{b,}\textsuperscript{*}, Young Do Kim\textsuperscript{b}

\textsuperscript{a}Department of Environmental Engineering, Pukyong National University, 599-1, Daeyeon3-dong, Nam-gu, Busan 608-737, Korea, Tel. +82 51 629 6528; email: iikim@pknu.ac.kr (I-K. Kim)

\textsuperscript{b}School of Environmental Science and Engineering, Inje University, Kimhae 621-749, Korea, Tel. +82 55 320 3251; email: envkwon@inje.ac.kr (J. Kwon), Tel. +82 55 320 3255; email: ydkim@inje.ac.kr (Y-D. Kim)

Received 20 June 2013; Accepted 9 December 2014

\textbf{ABSTRACT}

The degradation of trichloroethylene (TCE) by ferrate generated from electrochemical synthesis has been studied. The degradation efficiency of TCE in aqueous solution was observed at various pH (3, 7, 11), ferrate dosages (5, 8, 11, 13, 15 and 17 mg/L), and temperature (10, 25, 35 and 50°C). The experimental results showed that TCE removal efficiency increased with an increase in ferrate dosages. For the effect of pH, the highest value of $k_{\text{app}}$, 893.54 M\textsuperscript{−1}s\textsuperscript{−1}, was observed at pH 7. The TCE degradation pathways have been proposed based on the intermediate products such as ethyl chloride, dichloroethylene, chloroform, 1,1-dichloropropene, trichloroacetic acid and trichloroethane, and Cl\textsuperscript{−} was identified as an end product.

\textbf{Keywords:} Ferrate(VI); Trichloroethylene; Reaction pathway; Intermediate study