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Fast and efficient inactivation of antibiotic resistant *Escherichia coli* by iron electrode-activated sodium peroxydisulfate in a galvanic cell

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Abstract

Antibiotic overuse has led to the emergence of antibiotic resistant bacteria. However, ordinary disinfection methods are not environment friendly and are inefficient in preventing the spread of antibiotic resistant bacteria. Therefore, this study investigated a novel and efficient electrolytically enhanced sulfate radical-based advanced oxidation process to disinfect antibiotic resistant *Escherichia coli* (AR *E. coli*) in aqueous solution. Sterilization of AR *E. coli* using the coupled process of Fe^{2+}/peroxydisulfate (PDS) and electrolysis treatment of galvanic cell (galvanic cell-Fe^{2+}/PDS, named GFP) was evaluated. Various process parameters, including temperature, PDS dosage, electrolyte concentration, and Cl^- concentration, were investigated. The active radicals involved in the GFP process were identified, and the changes in cell substances were determined by Fourier transform infrared spectroscopy and flow cytometry. Intracellular protein leakage and acute effluent biotoxicity were also analyzed to evaluate the performance of the proposed method. The GFP system demonstrated a high disinfection efficiency (7.882-log inactivation within 20 min), indicating that the novel system is a promising treatment for the removal of AR *E. coli* in water.

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