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Enhanced oxidation of Erythromycin by persulfate activated iron powder - H_2O_2 system: Role of the surface Fe species and synergistic effect of hydroxyl and sulfate radicals

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Abstract: Erythromycin (ERY) is one of macrolide antibiotics which are hardly removed by conventional water treatment process. In this study, the degradation of ERY using a H_2O_2 and persulfate combined process was assessed. Neutral and acidic conditions are superior to alkaline condition in the results of ERY degradation. The Cl^- exhibited dual effects (favorable or adverse) distinctively on ERY degradation, while HCO_3^-, CO_3^{2-} and humic acid significantly inhibited ERY degradation. The results showed that with the persulfate/H_2O_2 molar ratio improved from 0:10 to 1:9 (total oxidants dosage was 0.1 mM), the ERY degradation efficiency increased from 6.5% to 90.0%. Effective oxidation of ERY only occurred after adding persulfate with the formation of surface-associated Fe(II) on the ZVI surface facilitating rapid and extensive decomposition of H_2O_2. Undetectable concentration of dissolve Fe^{2+} suggested that the generation of HO• was mainly from the surface-located