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Juri Bolobajev, Marina Trapido, Anna Goi

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Improvement in iron activation ability ofalachlor Fenton-like oxidation by ascorbic acid

Juri Bolobajev*, Marina Trapido, Anna Goi

Department of Chemical Engineering, Tallinn University of Technology, Ehitajate tee 5,

Tallinn 19086, Estonia

*Corresponding author. Tel.: +372 6204341; fax: +372 6202856. Email: juri.bolobajev@ttu.ee

(J. Bolobajev).

ABSTRACT

The addition of a strong reductant, L-ascorbic acid (AA), to Fe^{3+} /hydrogen peroxide (H_2O_2) improvedalachlor degradation substantially. AA in the form of ascorbate monoanion undergoes a two-step oxidation to yield dehydroascorbic acid through the formation of intermediate semidehydroascorbate and ascorbyl radicals that are responsible for the autocatalytic transformation of Fe^{3+} to Fe^{2+} . The ability of AA to reduce Fe^{3+} to Fe^{2+} and propagate the formation of hydroxyl radicals was confirmed by the indirect measuring of hydroxyl radicals. Hydroxyl radicals production andalachlor degradation by $\text{H}_2\text{O}_2/\text{AA}$ resulted. Alachlor degradation rate by $\text{Fe}^{3+}/\text{H}_2\text{O}_2/\text{AA}$ was similar to that obtained by $\text{Fe}^{2+}/\text{H}_2\text{O}_2$, although a much loweralachlor degradation and mineralization by $\text{Fe}^{3+}/\text{H}_2\text{O}_2$ was achieved. The kinetics ofalachlor removal by $\text{Fe}^{2+}/\text{H}_2\text{O}_2$ and $\text{Fe}^{3+}/\text{H}_2\text{O}_2/\text{AA}$ were characterized by a rapid decay (0–1 min) because of a higher formation of hydroxyl radicals and then by a slower decay (1–120 min). The determination of a second-order reaction rate constant of hydroxyl radicals withalachchlor relied on the competitive reactions of deoxyribose andalachchlor with hydroxyl radicals. A rate constant of $6.9 \times 10^9 \text{ M}^{-1} \text{ s}^{-1}$ (correlation

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