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Synergistic effect of activated carbon and ultrasonic irradiation on persulfate activation

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ABSTRACT

Activated carbon (AC) was effective to activate persulfate (PS). Herein, ultrasonic irradiation (US) was introduced into the AC/PS system, and synergistic activation of PS by the combination of US and AC was observed. The effects of various operating parameters on the decolorization of acid orange 7 (AO7), a typical azo dye, by AC/US/PS process were investigated. The results indicated that the decolorization of AO7 gradually increased with increasing AC loading and higher US power. Also, AO7 decolorization efficiency increased with PS/AO7 ratio increasing from 1 to 100, but decreased when the ratio was further increased to 200. pH had little effect on AO7 decolorization, with neutral or slight acidic pHs most suitable for AO7 decolorization. The presence of Cl^- slightly accelerated AO7 decolorization, and the accelerating effect increased with increasing concentration of Cl^-. The radical quenching experiments indicated that AO7 decolorization dominantly took place on the surface of AC, and both $SO_4^{-\cdot}$ and HO· were responsible for AO7 decolorization. The azo band and naphthalene ring of AO7 were destroyed to generate other small intermediate, and finally mineralized to CO_2 and H_2O.

Keywords: Persulfate; Activated carbon; Ultrasonic irradiation; Synergistic activation

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