

Complementarity and action mechanisms of Fe²⁺ activated persulfate and H₂O₂ system

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Abstract

The Fe²⁺ activated persulfate and H₂O₂ (Fe²⁺/KPS/H₂O₂) system achieved 94% removal of four mixed sulfonamides with 300 s treatment and possessed excellent complementarity and stability in a wide of pH (3 – 11) and temperature (5 – 65). The quenching and electron spin resonance spectrometer results confirmed that sulfate radicals and hydroxyl radicals coexisted in the coupled system and were responsible for eliminating sulfonamides under ambient conditions. Experimental determination and density functional theory calculations demonstrated that the reaction rate constants of sulfate radicals and hydroxyl radicals at possible reactive sites distinguished the difference in removal ratios of four sulfonamides. The removal ratio of sulfathiazole was higher than others because its calculated reaction rate constants of sulfate radicals and hydroxyl radicals were higher than those of sulfamerazine, sulfamethoxazole, and sulfamethazine. The finding provided a reference for investigating the removal mechanism of mixed organic pollutants when multiple free radicals coexist.

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