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UV/persulfate and UV/hydrogen peroxide processes for the treatment of salicylic acid: effect of operating parameters, kinetic, and energy consumption

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ABSTRACT

Two advanced oxidation processes (AOPs), based on UV light irradiation with potassium persulfate (UV/KPS) and with hydrogen peroxide (UV/H_2O_2), were employed for the treatment of salicylic acid (SA) in aqueous media. The influence of operating parameters, initial pH and concentration of the oxidant reagents, was investigated. Under the optimum conditions of pH 6 and [KPS] = 1,000 mg/L for UV/KPS and pH 4 and [H_2O_2] = 140 mg/L for UV/H_2O_2, about 94 and 98% SA degradations were achieved after 60 min treatments. Total organic carbon removal was also obtained as 80% and 87%, respectively, after 150 min. Rate of SA degradation in these processes obeys pseudo-first-order kinetic. For UV/KPS process, the role of active radicals was studied using ethanol and tert-butyl alcohol radical scavengers, indicating the contribution of hydroxyl and sulfate radicals in the degradation of about 56% and 44%, respectively. The electrical energy consumption, for nearly complete degradation of SA, was evaluated and the preference was shown in comparison with previous works.

Keywords: Salicylic acid; UV/KPS; UV/H_2O_2; Kinetic; Energy consumption

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