

Effects of nitrate on the UV photolysis of H₂O₂ for 2,4-dichlorophenol degradation in treated effluents

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ABSTRACT

The major objective of this study was to delineate the effect of nitrate on the UV oxidation of 2,4-DCP by conducting a bench-scale operation at various reaction times, and initial concentrations of H₂O₂ and NO₃⁻. 2,4-DCP (20±5 µg/L) was oxidized in very limited amounts through direct UV photolysis, without additional oxidation by hydroxyl radicals. However, it was completely oxidized with an initial H₂O₂ concentration of 20 mg/L at a reaction time of 1.0 min under the operating conditions described below. The practical reaction time for 80% oxidation turned out to be 2.0 min (with a high UV dose) with an initial H₂O₂ concentration of 10 mg/L. Nitrate enhanced the 2,4-DCP oxidation by the hydroxyl radicals produced from nitrate photolysis with the relatively low initial H₂O₂ concentrations of 0.0 to 5 mg/L, but hindered the oxidation, when an initial H₂O₂ concentration in the reactor was less than or around about 10 mg/L. The adverse effect of nitrate on the 2,4-DCP oxidation was not observed with a relatively high initial H₂O₂ concentration of 20 mg/L at the reaction times of 1.0 to 2.0 min. The scavenging effect of nitrate on the 2,4-DCP oxidation was generally limited with the concentration ranges tested in this study.

Keywords: 2,4-dichlorophenol; UV oxidation; Nitrate; Nitrite; UV/H₂O₂ process

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