Degradation of Ortho-Toluidine in petrochemical wastewater by ozonation, UV/O₃, O₃/H₂O₂ and UV/O₃/H₂O₂ processes

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ABSTRACT

In this research, degradation of Ortho-Toluidine (OT) that is considered toxic and carcinogenic in the wastewater of petrochemical industries was investigated by advanced oxidation processes in circulating photoreactor. The effect of some operational parameters such as pH, flow rates of ozone, dosage of the OT, and concentration of hydrogen peroxide pollutant was investigated. The degradation and relative mineralization of the OT were estimated by HPLC and COD tests, respectively. Optimal conditions were determined by using a factor at the time. The maximum reduction in COD was 57 and 70.2% for ozonation (initial pH 9) and UV/O₃ (initial pH of 11), respectively. In H₂O₂/O₃ (initial pH 9, initial concentration of H₂O₂ = 40 mM) and UV/O₃/H₂O₂ processes (initial pH of 10, initial concentration of H₂O₂ = 20 mM), 65.5 and 82.5% of COD removed, respectively. Reaction time for COD removal of OT solution in all processes was 120 min. Optimal dosage of ozone was 0.5 l/min for all processes based on ozone. Also, after 40 min of reaction, the degradation percent of OT was 100, 90.7, 89.5, and 85.5% for UV/O₃/H₂O₂, UV/O₃, O₃/H₂O₂, and O₃ processes, respectively. The optimum concentration of the OT was obtained at 100 mg/l in all processes. From the kinetic study, it was clear that the mineralization was slower than the degradation and the best process was the UV/O₃/H₂O₂ since it achieved the highest degradation and mineralization efficiency.

Keywords: Advanced oxidation processes (AOPs); Ortho-Toluidine (OT); Degradation; COD (chemical oxygen demand); High-performance liquid chromatography (HPLC)

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