Treatment of o-Cresol/4-chlorophenol binary mixtures in aqueous solutions by TiO$_2$ photocatalysis under UV irradiation

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ABSTRACT

Photocatalytic degradation of single and binary mixtures of o-cresol and 4-chlorophenol (4-CP) over TiO$_2$ suspensions under UV irradiation was studied and the mixture effect was discussed. The effects of operating parameters such as initial reactant concentration (0.16–1.04 mM), solution pH (4.50–9.35), and UV light intensity (20–100 W) on the degradation were investigated. It was shown that the degradation of single or binary mixtures of reactants in aqueous solutions could be described by the pseudo-first-order kinetics according to the Langmuir–Hinshelwood model. When the second reactant was in excess, the degradation rates of o-cresol and 4-CP in binary mixture systems were slower than those in single systems. At a fixed o-cresol concentration of 0.45 mM, for example, the apparent first-order rate constant $k_{app}$ for o-cresol degradation was 0.323, 0.275, and 0.220 h$^{-1}$ when 0.15, 0.30, and 0.45 mM of 4-CP was present, respectively.

Keywords: Photocatalytic degradation; o-Cresol; 4-Chlorophenol; TiO$_2$; Binary mixtures; UV irradiation

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