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TiO₂ / H₂O₂ mediated UV photocatalysis of Chlorpyrifos: Optimization of process parameters using response surface methodology

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HIGHLIGHTS

- Chlorpyrifos contaminated water was treated using TiO₂/H₂O₂ mediated UV photocatalysis.
- COD degradation was found to enhance after the treatment.
- Optimization of process parameters: H₂O₂, TiO₂ and pH, was achieved using Box Behnken approach in combination with Response surface methodology.
- TiO₂/H₂O₂ mediated photocatalysis was found to be more effective than other advanced oxidation processes: H₂O₂, UV + H₂O₂, UV + TiO₂, in treatment of Chlorpyrifos.

Abstract

Chlorpyrifos (CP), an organophosphate pesticide which is used extensively in agricultural fields of various developing countries, is found to cause neurological and immunological effects on living beings. In this study, TiO₂/H₂O₂ mediated UV photocatalytic oxidation of CP was investigated in a laboratory-scale photo-reactor. Experiments were designed using three level Box-Behnken factorial design (BBD) technique combined with response surface methodology (RSM). Effects of the process parameters such as concentration of TiO₂, concentration of H₂O₂ and initial pH on the response parameters like degradation of chemical oxygen demand (COD) and degradation of CP were analyzed using polynomial regression models. After 3 h reaction

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