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TiO_2 / H_2O_2 mediated UV photocatalysis of Chlorpyrifos: Optimization of process parameters using response surface methodology

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HIGHLIGHTS

- Chlorpyrifos contaminated water was treated using TiO_2/H_2O_2 mediated UV photocatalysis.
- COD degradation was found to enhance after the treatment.
- Optimization of process parameters: H_2O_2, TiO_2 and pH, was achieved using Box Behnken approach in combination with Response surface methodology.
- TiO_2/H_2O_2 mediated photocatalysis was found to be more effective than other advanced oxidation processes: H_2O_2, UV + H_2O_2, UV + TiO_2, 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, TiO_2/H_2O_2 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 TiO_2, concentration of H_2O_2 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