Photocatalytic degradation and mineralization of diazinon in aqueous solution using nano-TiO$_2$ (Degussa, P25): kinetic and statistical analysis

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**ABSTRACT**

In this study, photocatalytic degradation of diazinon was investigated using nano-TiO$_2$, Degussa P25, as a photocatalyst and the effects of some operational parameters such as aeration, pH, photocatalyst concentration, and the irradiation time were also examined. Dispersive liquid-liquid microextraction technique was used to extract and pre-concentration of residual diazinon from the liquid samples and all experiments were carried out by gas chromatography. Amount of degradation and mineralization were determined by gas chromatograph with flame ionization detector (GC/FID) and COD measurements, respectively. The optimum condition for degradation of diazinon has been obtained in the pH 6, [nano-TiO$_2$] = 0.2 g/L, and [time] = 120 min. In the optimal condition the removal efficiency of diazinon and COD were 99.64 and 65%, respectively. The results have shown that the nano-TiO$_2$, aeration and time of reaction have a positive effect on photocatalytic degradation of diazinon and COD removal. Statistical analysis showed that the maximum removal of diazinon and COD were due to UV irradiation (71%, 41%), exposure time (16%, 39%), aeration (7%, 4%), and increased concentration of nano-TiO$_2$ (0.4%, 2%), respectively; and the kinetics of photodegradation were found to follow a first-order kinetic model and the constant rate, at optimal condition, was 0.038 (min$^{-1}$).

**Keywords:** Diazinon; Mineralization; Nano-TiO$_2$; Photocatalytic degradation

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