Desalination and Water Treatment
www.deswater.com
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doi: 10.5004/dwt.2010.1000

13 (2010) 427–436
January

Photocatalytic degradation of diazinon in aqueous solution by platinized TiO_2

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Received 13 May 2009; Accepted 26 October 2009

ABSTRACT

The photocatalytic degradation of diazinon, which is one of phosphorothiate insecticides, was carried out in the presence of platinized TiO_2 photocatalyst. The degradation rate was strongly influenced by the pH, catalyst dosage and light intensity. In addition, platinization was found to increase the rate of diazinon degradation. When 0.5 wt% of platinum was deposited onto the surface of TiO_2, an initial diazinon concentration of 30 mg L^{-1} was completely degraded after 30 min. Furthermore, the first-order rate constant for diazinon degradation by Pt-TiO_2 was 2.5 times higher than P-25 TiO_2. The decrease of TOC as a result of mineralization of diazinon was observed during the photocatalytic process. The degree of diazinon mineralization was about 88% under UV irradiation after 30 h. The formations of sulfate, phosphate, nitrate and ammonium ions as end-products were observed during the photocatalytic system. The decomposition of diazinon gave six kinds of intermediate products. The degradation mechanism of diazinon was proposed on the base of the evidence of the identified intermediates. Based on these results, the photocatalytic reaction by Pt-TiO_2 could be useful technology for the treatment of wastewater containing diazinon.

Keywords: Diazinon; Photocatalyst; Titanium dioxide; Platinum; Mineralization

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