

## Photocatalytic removal of 2,4,6-trichlorophenol from water exploiting commercial ZnO powder.

### Abstract

2,4,6-trichlorophenol is an important water pollutant owing to the severity of its toxicity. The aqueous phase photocatalytic oxidation of 2,4,6-trichlorophenol over ZnO was investigated as a potential method for the abatement of this pollutant. The effects of operating parameters such as initial ZnO doses and substrate concentration on the removal of 2,4,6-trichlorophenol were studied and optimised at 0.75 g L<sup>-1</sup> and 50 mg L<sup>-1</sup>, respectively. The photocatalytic system afforded the highest degradation efficiency at neutral pH. The decomposition of 2,4,6-trichlorophenol by the photoprocess agreed satisfactorily with pseudo zero-order kinetic model. The effect of the presence of SO<sub>4</sub><sup>2-</sup>, S<sub>2</sub>O<sub>8</sub><sup>2-</sup>, HPO<sub>4</sub><sup>2-</sup> and Cl<sup>-</sup> on the 2,4,6-trichlorophenol removal rate was for the first time revealed. Some hitherto unreported pathway intermediates of ZnO-assisted 2,4,6-trichlorophenol degradation were recorded using gas chromatography–mass spectrometry (GC–MS) and high performance liquid chromatography (HPLC). A tentative reaction mechanism for the formation of these intermediates was proposed.

Keyword: Photocatalysis; Intermediates; 2,4,6-Trichlorophenol removal; ZnO; Anions.