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Photocatalytic oxidation of isoflurane, an anesthetic gas: the influence of operating parameters

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ABSTRACT

Photocatalytic oxidation (PCO) is a technology that has been suggested as an alternative energy efficient method to improve Indoor Air Quality (IAQ) in several indoor air spaces. In the past few years, several studies have been made to assess the feasibility of PCO for the removal of VOCs that are commonly found in most indoor environments like homes and schools. There are however little or no studies on other indoor environments like hospitals. In hospital operating rooms, anesthetic gases such as isoflurane are known to be one of the main pollutants found in the air. The present work therefore studies the efficiency of PCO to remove isoflurane by studying the influence of three operating parameters on the degradation process. The operating parameters investigated were air velocity, light intensity and initial concentration. The experiments were carried out in a closed-loop multi pass reactor. The kinetic degradation curve of isoflurane showed two distinct phases; the first phase where the degradation occurred slowly and a second phase where the degradation accelerated and fit a first order decay model. Two quantitative indicators, the induction time and the single pass removal efficiency were chosen to compare the influence of the parameters on the first and second phases respectively. Increasing the air velocity led to longer induction periods and lower single pass removal efficiencies. Induction period was decreased when light intensity was increased and removal efficiencies increased by half order. Lower induction periods and better removal efficiencies were obtained at lower concentrations**.** Although some intermediates were identified, their low concentrations mean they may not pose significant negative effects to human health.

Keywords: PCO; Indoor air purification; Hospital; Operating Rooms; Isoflurane