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# Comparative studies on $TiO_2$/ZnO photocatalyzed degradation of 4-chlorocatechol and bleach mill effluents

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**ABSTRACT**

The study presents a comparative account on $TiO_2$ and ZnO facilitated photocatalytic degradation of 4-chlorocatechol (4-CC) typically found in bleach mill effluents (BME). The effect of major process parameters such as catalyst dose, pH, oxidant concentration, and source of light (UV/solar) on degradation efficiency has been investigated. The degradation efficiency of 4-CC was assessed in terms of absorbance as a function of irradiation time. Of the two catalysts screened, ZnO has been observed to be a better catalyst over $TiO_2$. The maximum degradation of 99.2 and 91.6% was obtained with 1.5 g/L ZnO, at pH 8, after 2 h irradiation and with 2.5 g/L $TiO_2$, at free pH (6.5), 0.04 M NaOCl concentration after 6 h irradiation, respectively. Further, the kinetics of degradation process was found to follow pseudo-first-order reaction. The photocatalytic process was applied to treat actual BME and degradation of effluent, observed in terms of chemical oxygen demand reduction, was 36.5 and 39% with UV/$TiO_2$/NaOCl and UV/ZnO systems, respectively. A 10-fold dilution of effluent was, however, needed to make the effluent amenable to photocatalytic treatment. Degradation efficiency at optimized conditions under solar mode was almost the same as under UV irradiation, thus demonstrating the commercial viability of the process.

*Keywords:* Photocatalysis; Titanium dioxide; Zinc oxide; Sodium hypochlorite; COD; 4-Chlorocatechol; Bleach mill effluents

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