Photocatalytic degradation of Tire Cord manufacturing wastewater using an immobilized nanoTiO$_2$ photocatalytic reactor

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ABSTRACT

In this study, an immobilized nanoTiO$_2$ photocatalyst was developed for the degradation of Tire Cord manufacturing wastewater with low BOD$_5$/COD ratio (0.1–0.2). The interactive effects of three numerical independent factors (initial COD concentration, initial pH, and reaction time) on the process performance were studied. The process performance was evaluated by monitoring three process responses including COD removal efficiency, specific COD removal rate and BOD$_5$/COD ratio after treatment. The process was modeled and analyzed using response surface methodology. Maximum COD removal efficiency and BOD$_5$/COD ratio were modeled to be 38% and 0.5, respectively, at COD in of 350 mg/l and initial pH of 11. The photocatalytic process induced by O$_3$ and O$_3$/H$_2$O$_2$ showed a remarkable improvement in the process responses studied. Photocatalytic process with sequence regeneration with ozonation could achieve higher COD removal efficiency and BOD$_5$/COD ratio relative to that obtained from regeneration by aeration.

Keywords: Tire Cord wastewater; Photocatalytic degradation; Immobilized photocatalytic reactor; Titanium dioxide

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