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OPTIMIZATION OF PROCESS PARAMETERS FOR THE PHOTOCATALYTIC TREATMENT OF PAPER MILL WASTEWATER

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Abstract

Photodegradation of the organic matter present in pulp and paper mill wastewater has been investigated under UV (Ultra Violet) radiation with titanium dioxide (TiO_2) as a catalyst in a slurry-type of reactor. Combined wastewater following primary clarification is used for the optimization of various process parameters i.e., catalyst dose, initial pH, reaction time, light intensity, organic load, oxidant concentration, and temperature of the reaction mixture. The optimum photocatalytic treatment conditions obtained are: pH 7.0, TiO_2 0.5g/L, H_2O_2 15mM/L, and reaction time 4 hr. The addition of a small amount of H_2O_2 (hydrogen peroxide) as an electron acceptor to the UV/TiO_2 system enhances the photodegradation efficiency. UV/TiO_2/H_2O_2 system with 64.8% COD (chemical oxygen demand) and 89.2% color reduction is more efficient for the degradation of pulp and paper mill wastewater compared to UV/TiO_2 (54.2% COD and 82% color reduction) under optimized conditions. The treatment efficiency decreased with an increase in distance between the UV lamp and surface of the reaction mixture. The photodegradation was found to be little affected by the temperature.

Key words: advanced oxidation treatment, paper mill wastewater, titanium dioxide, UV/TiO_2, UV/TiO_2/H_2O_2

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