

Treatment of the oil refinery wastewater using photocatalysis

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Abstract

Treatment of synthetic oil refinery wastewater employing TiO_2 assisted photocatalytic degradation (PCD) process was studied. Phenol was used as the model pollutant in all the experiments. Both UV light and TiO_2 were required for effective removal of phenol from the aqueous phase. For phenol-only studies, near complete phenol degradation was noted within 360 min. The removal of phenol in presence of oil, ammonia, lead, cyanide, sulfate, thiosulfate, and mercury, was also studied in order to assess their effect on the phenol PCD. Presence of these species showed varying effects on the PCD trend of phenol. The presence of oil was generally noted to reduce the overall phenol removal from the contaminated water. Similarly, the time required for overall phenol PCD also increased in presence of both lead and thiosulfate. However opposite was noted for mercury. For mixed phenol and ammonia PCD systems at 10 and 5 ppm concentrations respectively, significant phenol removal was observed at pH 5, but with insignificant ammonia removal. However at pH 11 large ammonia removal was noted with insignificant phenol removal. Overall within an increase in pH reduced phenol and increased ammonia PCD was noted. Nevertheless the overall ammonia removal at pH 11 generally decreased with an increase in the ammonia concentration. Presence of cyanide also reduced the phenol removal efficiency. Several mechanisms explaining the trends as noted in the present work have been discussed.