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Sushma, Anil K. Saroha



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Treatment of industrial organic raffinate containing pyridine and its derivatives by coupling of catalytic wet air oxidation and biological processes

Sushma and Anil K. Saroha*

Department of Chemical Engineering, Indian Institute of Technology, Delhi

Hauz Khas, New Delhi – 110016, India

ABSTRACT

The treatment of non-biodegradable industrial organic raffinate containing refractory and toxic organic compounds pyridine, β -picoline and 3-cyanopyridine has been studied by coupling of catalytic wet air oxidation (CWAO) over alumina based platinum catalyst and biological processes. The alumina based platinum catalyst was characterized and the stability of the catalyst was studied. The CWAO experiments were performed in a glass reactor at atmospheric pressure and the effluent treatment efficiency was evaluated in terms of chemical oxygen demand (COD) removal. The effect of various parameters such as air flow rate, reaction temperature, platinum loading and catalyst dosage on the COD removal was studied. The optimum values of air flow rate, platinum loading and catalyst dosage were found to be 1 L/min, 1 wt. % and 3 g/L respectively and a COD removal of 45 % was obtained at the optimum conditions at reaction temperature of 70°C. The CWAO experimental results were found to be in agreement with the lumped kinetic model. The toxicity test using *E. coli* bacteria and the biodegradability study were performed. The toxicity of the effluent decreased considerably while the BOD/COD ratio was found to increase significantly after the CWAO. The aerobic biological treatment confirmed the biodegradability enhancement and a total COD removal of 98.4 % was obtained after 10 days of aerobic treatment of the CWAO effluent.

Key words: Catalytic wet air oxidation, Industrial organic raffinate, Platinum catalyst, COD removal, Biodegradability, Toxicity.

*Corresponding author Email: aksaroha@chemical.iitd.ac.in

Tel: +911126591032

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