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Bioremediation of wastewaters containing various phenolic compounds by phenol-acclimated activated sludge

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ABSTRACT

This study was conducted to investigate the potential of activated sludge which had been acclimated to phenol in biodegrading different concentrations of various phenolic compounds in the batch reactors. The phenol-acclimated activated sludge was capable to completely remove the initial phenol concentration of 280 mg/L, which was twice the concentration it had been acclimated. In the presence of *o*-cresol and *m*-cresol at the initial concentration of 280 mg/L each in the separated batch reactors, more than 95% of cresols could be removed by the phenol-acclimated activated sludge. However, the phenol-acclimated activated sludge was only able to achieve 38% of 4-chlorophenol removal efficiency at this initial concentration. The presence of 2-chlorophenol and 3-chlorophenol in the separated batch reactors at initial concentrations of, as low as, 35 mg/L was adequate to inhibit the phenol-acclimated activated sludge from removing them. The kinetic data for the phenolic compounds and their respective chemical oxygen demand (COD) removal were well fitted to the pseudo-first-order formulation. The pseudo-first-order rate constants of each phenolic compound and their respective COD removal demonstrated that the toxicity exerted by each phenolic compound which inhibited its own degradation followed 2-chlorophenol > 3-chlorophenol > 4-chlorophenol > *o*-cresol > *m*-cresol > phenol.

Keywords: Activated sludge acclimated to phenol; Degradation of phenolic compounds; Removal efficiency; Pseudo-first-order rate constant

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