

OPTIMIZATION OF THE REACTION CONDITIONS FOR ENZYMATIC REMOVAL OF PHENOL FROM WASTEWATER

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Phenols are frequently found in the waste effluents from a number of industrial processes including coal conversion and petroleum refining. Since many phenols and phenolic compounds have been listed as hazardous pollutants, it is therefore desirable to develop efficient processes for the removal of these compounds from wastewater. HRP, Horseradish peroxidase enzyme is effective for the removal of phenol and phenolic compounds from aqueous solutions by catalyzing the formation of insoluble polymeric phenolic aggregates. HRP catalyses the oxidation of phenols in the presence of hydrogen peroxide resulting the formation of water-insoluble polymers which can be separated by coagulation and sedimentation. The feasibility of the enzyme process to treat a real wastewater collected from a petroleum refinery containing 1.0 mM of total phenols was examined. Each enzyme/wastewater system was optimized for the following chemical dosages; hydrogen peroxide, enzyme, polyethylene glycol (PEG), and buffer. Furthermore, the reaction time to achieve at least 95% removal of phenols was determined. Experimental results have shown that an increase in the H₂O₂ concentration beyond the optimum dose resulted in enzyme inactivation, thus reducing the phenol removal efficiency. On the other hand, increasing the enzyme, PEG, and/or reaction time beyond the optimum values resulted in only a marginal increase in removal efficiency. Approximately 58% of COD, and 80% BOD₅ were also removed along with the phenols.

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