concentration on the rate of mineralization were investigated and will be discussed. These studies have demonstrated that immobilized *P. chrysosporium* cells hold great promise for waste treatment applications.

Biodegradation of multiple substrates stripped from contaminated soils

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Abstract

Biological treatment has become a widely used technique in treating a wide range of organic hazardous compounds of industrial origin. Naturally occurring microorganisms can be acclimated to single or multiple substrates which they break down into non-toxic end products or carbon dioxide and water. Combinations of substrates which enhance the degradation rates of more recalcitrant compounds among other optimization techniques make biodegradation a cheap, efficient, and complete method of removing hazardous compounds from the environment. In our studies we investigated microbial kinetics of multiple substrate feeds with acclimated microorganisms in pulse-fed batch reactors and chemostats. The feasibility of air stripping organic hazardous substances from solid and introducing them to bioreactors via the air stream was also investigated.

We studied the synergistic and antagonistic interactions of multiple substrate degradation to determine if they could be combined to optimize the degradation of the selected compounds. The tested substrates included glucose, phenol, pentachlorophenol (PCP), and dichlorophenol (DCP). Long term studies on the batch fed reactors revealed preferential substrate degradation in the order of glucose, phenol, and pentachlorophenol. The presence of glucose improved the rate of phenol degradation. Phenol was found to enhance PCP degradation, but glucose and PCP were degraded independently. Using the technique of initial rate experiments with the batch-fed cultures, we were able to calculate growth rates and other kinetic parameters through a parameter estimation algorithms developed in-house.

The chemostat reactors were designed with significant recycle to ensure a

dense, acclimated population of microorganisms to degrade the multiple substrate combinations of phenol, PCP and DCP. At a slow growth rate, the microorganisms can completely degrade the test compounds and generate minimal sludges.

Bioremediation and biomonitoring of an oil-based sludge-contaminated site

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Abstract

Production of hazardous waste in the United States exceeds the capacity available for storage and treatment of these wastes. While onsite bioremediation of oil-based sludges may be a viable alternative to the offsite shipping and storage of wastes, concerns regarding the possible production of more toxic intermediates during degradation have been raised. In this study, bioremediation of an oil-based sludge-contaminated site is being conducted in concert with short term bioassays which will monitor the progress of waste degradation. Assays including Microtox (toxicity), Ames (point mutation), and Prophage Induction (SOS response) are being used. Following two weeks of bioremediation of contaminated soil in a laboratory reactor, an enhanced mutagenic response in both the Ames and Prophage assays was obtained after 13 days. Further experiments are ongoing with longer time frames to determine the time required for the degradation of the biologically active compounds. The sources of the active components are being pursued as both metals and organic toxicants have been identified in the sludges. This approach using biomonitoring concurrently with bioremediation will assist in the determination of feasibility of this technology in future large-scale cleanup procedures.
