A STUDY OF SOLIDIFICATION/STABILIZATION PROCESS FOR DISPOSAL OF PENTACHLOROPHENOL

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Abstract

Solidification/Stabilization (S/S) are emerging technologies for disposal of toxic waste. However, they have been applied mostly to inorganic toxic wastes. In the present study, we investigated the applicability of S/S technologies for disposal of a widely used toxic organic compound, pentachlorophenol (PCP), in the cementous matrix. Effect of a number of parameters (temperature, pH, sonic energy, method of mixing) on the ability of cement to hold PCP was examined. UV-VIS spectrophotometry was used to determine the leaching of PCP from cement and FT-IR was employed to study the mechanistic details. The results of the present work indicate that PCP can be almost fully retained by the cement. A very small amount of PCP that leaches from the surface of the solidified product can be reduced to a negligible amount by encapsulating it with a cement jacket.

MICROBIAL DEGRADATION OF HAZARDOUS WASTES TO NON-TOXIC END-PRODUCTS

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Abstract

The generation of large quantities of toxic wastes in the form of phenolic compounds, halogenated hydrocarbons, and volatile organic chemicals has resulted in requirements for new and environmentally safe methods for elimination. One method used to reduce the volume of toxic waste chemicals is the construction of microbial reaction systems that are capable of degrading toxic

chemicals and discharging non-toxic or less toxic products. The applicability of biological fermentation processes for the degradation of phenol, pentachlorophenol, and toluene to non-toxic end-products has been investigated for its potential use as a large-scale unit process. Acclimatization of the batch reactors has been achieved for phenol concentrations ranging from 50 mg/l to 300 mg/l, 1 mg/l pentachlorophenol, and a complex chemical mixture consisting of: 50 mg/l phenol, 1 mg/l pentachlorophenol, and 390 mg/l glucose. Decay rates for a reactor containing 350 mg/l phenol and 150 mg/l glucose have been established and compared to literature values for batch reactors containing 350 mg/l phenol. Future work includes determining decay rates for pentachlorophenol for a concentration of 5 mg/l, identification of the biodegradation end-products, and determination of a kinetic model for each toxicant.

SELECTIVE REMOVAL OF METALS FROM WASTE STREAMS

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Abstract

Copper, chromium, nickel, and zinc are frequently found in high concentrations in industrial waste water and can be removed by precipitation. Typical precipitation processes do not allow each metal to be precipitated separately, and hence selective metal recovery is not possible. It is desirable to recover each metal separately to allow recycling of metals and to satisfy waste minimization requirements. Chelation can be utilized to selectively remove metals from aqueous solution, since chelation can be controlled by pH. A study has been undertaken to determine the pH optima for removal of copper, nickel, and zinc by chelation with dithiozone. A similar study will be initiated to determine the pH optimum for removal of chromium by chelation with Aliquat 336, a high molecular weight amine. Percent extraction of metal was measured as a function of metal solution pH. Two dithiozone solvents, chloroform and carbon tetrachloride, were investigated. The preliminary results indicate that the optimum pH for extraction of copper with dithiozone–chloroform solution is near pH 3. As a solvent, chloroform allows more copper extraction than carbon tetrachloride. Carbon tetrachloride was rejected as a solvent due to the low solubility of dithiozone in carbon tetrachloride. The chelation reaction must be performed in a pH-buffered solution to maintain a constant pH. The results of this study will be utilized to design a process to selectively recover metals from industrial waste water.