in the rock to that in water. It was found that the geometric correction factor for diffusion in these rocks in all cases was less than the square of the porosity. Thus, it appears that the square of the porosity can be used as an upper bound on the geometric correction factor.

The research has been extended to sedimentary rocks from Mississippi and Texas which are typical of those formations which bound chemical waste injection zones.

Electrokinetic decontamination of soils

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Abstract

The purpose of electrokinetic treatment of soils is to aid in the recovery of heavy metals and other chemicals from contaminated soils. The process involves placing electrodes into subsurface wells and passing an electric current through the soil between the electrodes. Water and heavy metals will flow toward the negatively charged electrode where the chemicals can be collected and removed. The technology is particularly attractive for silt- and clay-rich soils (which are common along the Gulf coast) because, for such soils, electric currents are far more efficient in driving water and chemical flow than conventional pumping of water from wells.

Several laboratory experiments were performed on samples of kaolinitic soil that were "contaminated" with $Cu(NO_3)_2$. Tests were performed over a range in concentration of 0–320 mg/L Cu^{2+} and a voltage of 0–5 V. The amount of copper recovered from the negatively-charged reservoir (cathode) was very low. However, at the completion of the tests, the soil columns were sectioned and a large accumulation of Cu^{2+} was found in the soil adjacent to the cathode reservoir. Copper was transported toward the cathode, but because of the high pH in the soil near the cathode, copper was precipitated and therefore failed to enter the reservoir in significant quantities.

A model is being developed to predict boundary conditions in reservoirs and movement of contaminants in soil during electrokinetic treatment. Dissolution of alumina from the clay particles has been found to be critically impor-

tant in limiting pH increase near the anode. The experimental cell has been redesigned to permit continuous measurement of pH, voltage drop, and electrical conductivity. Theoretical predictions will be compared with measured results.

Expanded-bed batch column studies are in progress. Soil contaminated with phenol is mixed with nutrients and acclimated biomass. The three soils under different environmental conditions of nutrients and biomass are maintained as expanded beds in glass columns using the recirculated biomass slurry and air in the case of aerobic systems . Degradation rates are monitored and compared with those observed in the batch studies.

Preliminary results indicate that the addition of acclimated biomass enhances degradation of phenolic compounds on contaminated soils. The acceleration of the removal of phenolic compounds is more pronounced when the acclimated biomass is applied to soils which exhibited little or no biological activity.

Enhanced bioremediation of contaminated soil using acclimated biomass

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Abstract

The objective of this research program is an evaluation of the effects of biomass, acclimated to specific phenolic compounds, on the accelerated bioremediation of organically contaminated soils in place. The removal rates of phenol, *p*-cresol and 2,4-dichlorophenol mixed with well characterized fine sandy loam soil were established under three different environmental conditions: soil, soil plus nutrients (nitrogen and phosphorus) and soil plus nutrients and acclimated biomass. Aerobic biomass was collected at a local wastewater treatment facility and was acclimated to the specific phenolic compound in batch reactors without soil, but with essential nutrients added. The results of this phase of the study indicate that the removal rates were zero order.

The effectiveness of acclimated biomass in accelerating the removal of the specific phenolic compound was investigated initially in batch studies followed