gPRO® Technology

Bioremediation of Groundwater and Sediments Contaminated with PAH's

Attached is an excerpt from a paper given J B Hughes and CH Ward of Rice University concerning PAH's. PAH's are also known as polynuclear or polycyclic aromatic hydrocarbons. They can be thought of as 'fused ring' compounds where one or side of a ring (benzene for example) is shared with another ring. For example, naphthalene (moth balls) is a PAH and is two benzene rings with a common side.

Title: Bioremediation of Sediments Contaminated with Polynuclear Aromatic Hydrocarbons **Investigator:** J. B. Hughes and C. H. Ward **Institution:** Rice University

Undisturbed and dredged sediments are significant sources of environmental contamination, yet most sediment management, control, and remediation strategies currently in use are limited to no action at all, or dredging and use of unconfined land disposal, land-based Confined Disposal Facilities (CDF), unconfined aquatic disposal, and Confined Aquatic Disposal Facilities (CAD). Where applicable, bioprocesses for treatment of highly contaminated sediments, using high solids slurry reactors either in situ or ex situ, may offer significant returns. The major sources of PAH's in sediments are direct discharge of petroleum-containing wastes, coal gasification, and combustion processes. Regardless of origin, the resulting contamination consists of many individual PAH's with varying chemical characteristics. Two mechanisms of aerobic PAH degradation are known. First, the PAH can serve as a growth substrate. Two- and three-ring PAH's such, as naphthalene and phenanthrene are known growth substrates for bacteria. Second, the PAH can be metabolized as a secondary substrate in a process known as co-oxidation or cometabolism. This mechanism appears to be important for low solubility four- and five-ring PAH's such as chrysene and benzo -(a)-pyrene, which have been shown to be degradable but do not support bacterial growth. Mixing helps maintain aerobic conditions in a bioremediation system used to treat PAH-contaminated sediments. In addition to increasing O_2 transfer rates, this results in the suspension of sediment particles, and facilitates the release of contaminants from the sediments. Highly contaminated sediments, or sediments with high levels of reduced sulfur, may require forced aeration in addition to mixing to supply adequate levels of O_2.

iSOC® delivers high concentrations of dissolved oxygen and can be employed to biodegrade PAH's in groundwater.