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DEVELOPMENT OF A BIOLOGICAL BIOBARRIER FOR IN SITU TREATMENT OF GASOLINE-CONTAMINATED GROUNDWATER

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Abstract

New in situ remediation technologies are under development in order to treat groundwater contaminated by petroleum hydrocarbons. Among these technologies, permeable reactive barriers based on biological removal mechanisms (biobarriers - BBs) currently need lab-scale feasibility studies for optimal field applications. Among the different investigated filling materials, pumice showed the suitable physical-chemical properties affecting BB hydraulics and the highest sorption capacity of bacteria. Pumice was used in a lab-scale test aiming at simulating BB treatment in a wooden teflon-coated tank in which gasoline-contaminated water flew for 43 days of treatment. The concentration of the main contaminants in water and some chemical-physical parameters were monitored over time and at different distances from the water input in the BB. Denaturing Gradient Gel Electrophoresis (DGGE) analyses were also conducted on the filling pumice and at the end of the test to describe the development of the degrading microbial communities. The results of the chemical analyses showed a significant decrease in the steady-state concentrations of all compounds tested in the output column. DGGE indicated that the microbial communities were differentiated on the basis of their position along the BB. Particularly in the first part of the BB similar microbial communities developed and the main bacteria populations in this zone were *Xanthomonadaceae* and *Comamonadaceae*. Distinct, but similar among them, communities were found in the second part of the BB. In this part microorganisms belonging to *Thauera* sp. were dominant while *Hydrogenophaga* sp. microorganisms were evenly distributed along the BB.