ASSESSMENT OF BENZENE, MTBE AND AMMONIUM BIODEGRADATION IN A CONSTRUCTED AERATED TRENCH-SYSTEM

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A limiting factor for biodegradation of contaminants in aquifers such as hydrocarbons is the low availability of oxygen. We investigate abiotic and biotic processes in a pilot plant trench system, where anoxic groundwater, extracted from a gasoline-impacted site, is aerated to enhance biodegradation reactions. Different geotextiles (coconut fibers or polypropylene mats) are used for directing the water flow and enhancing the formation of pollutant-degrading biofilms. Two dimensional stable isotope analysis (13C/12C and 2H/1H) in combination with microcosm experiments is the main tool for assessing in situ biodegradation and identifying degradation pathways. We will present the development of the system in the first year of operation.

The concentration of benzene in the groundwater is constantly reduced from 20 mg/L in the inflowing groundwater to less than 1 µg/L in the outflow of the system. Only around 1 % of this removal can be due to volatilization and sorption processes, as preliminary experimentally results demonstrated. Colonized geotextiles taken from the system degraded benzene in rates of 0.3-4.4 g*h-1*m²-1 coupled to stable isotope fractionation of carbon in laboratory microcosms experiments. For coconut fiber textiles we observed a 5-20 times higher amount of bacteria and DNA, explaining the different benzene degradation rates. We conclude that biodegradation seems to be the dominant process for benzene removal within the trench system. No enhanced biodegradation of MTBE and ammonia could be confirmed so far.

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