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In situ microcosms (ISM) and laboratory batch microcosms (LBM) were used for determination of the first-order degradation rate constants of benzene, toluene, o-xylene, nitrobenzene, naphthalene, biphenyl, o- and p-dichlorobenzene, 1,1,1-trichloroethane, tetrachloromethane, trichloroethene, tetrachloroethene, phenol, o-cresol, 2,4- and 2,6-dichlorophenol, 4,6-o-dichlororesol, and o- and p-nitrophenol in an aerobic aquifer. All aromatic hydrocarbons were degraded in ISM and LBM experiments. The phenolic hydrocarbons were all degraded in ISM experiments, but some failed to degrade in LBM experiments. Chlorinated aliphatic hydrocarbons were degraded neither in ISM nor LBM experiments. Degradation rate constants were determined by a model accounting for kinetic sorption (bicontinuum model), lag phases, and first-order degradation. With a few exceptions, lag phases were less than 2 weeks in both ISM and LBM experiments. First-order degradation rate constants for aromatic and phenolic hydrocarbons ranged between 0.01 and 0.9 day\(^{-1}\). Local variations in first-order degradation rates and variations between rate constants determined by ISM and LBM were generally with in a factor of 5, but no systematic differences were observed between rate constants determined in situ and in the laboratory.

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