

**MONITORING OF MICROBIAL ACTIVITY AND DEGRADATION PATHWAYS IN CONTAMINATED
AQUIFERS USING IN SITU MICROCOSMS WITH 13C-LABELLED SUBSTRATES**

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The recently developed in situ microcosm system (BACTRAP®) allows the proof of in situ pollutant biodegradation. The test system is based on the use of isotopically labelled tracer compounds. ¹³C-labelled substrates (benzene, toluene, chlorobenzene or polycyclic aromatic compounds) are loaded to an adsorption material. During the incubation in the contaminated aquifer, microorganisms will grow on the adsorption material by using the labelled contaminants. The incorporation of the isotope label into microbial biomass will prove the in situ biodegradation of the test substrate. The transformation is assessed by means of carbon stable isotope analysis of biomarker molecules like fatty acids or amino acids, which are major constituents of cells. In addition, metabolites may be found on in situ microcosm allowing the reconstruction of degradation pathways governing the in situ biodegradation in contaminated aquifers.

The BACTRAP-system was applied at different field sites and with a range of contaminants. We were able to prove the in situ biodegradation of benzene, toluene, chlorobenzene, MTBE and polycyclic aromatic hydrocarbons in highly contaminated strictly anoxic aquifers. After incubation, the isotope label was detected in fatty acids and/or amino acids demonstrating the transformation of the ¹³C-labelled carbon into biomass und thus proving in situ biodegradation.

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