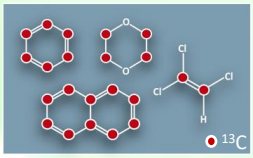
Isodetect
Umweltmonitoring GmbH

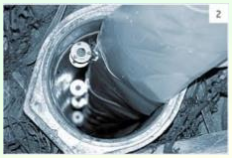
In situ Microcosms – BACTRAPS®

BACTRAPS are *in situ* microcosms loaded with a ^{13}C-labeled contaminant to sensitively prove its biodegradation directly at a polluted site. During exposure in a groundwater well, the microcosms are colonized by microorganisms. If microorganisms degrade the ^{13}C-labeled compound, the ^{13}C-label will be transformed into the biomass and can be traced within biomolecules. ^{13}C accumulation in the biomolecules provides a highly sensitive and clear evidence for *in situ* biodegradation of the target contaminant. The comparison of ^{13}C accumulation in the biomolecules at different areas of the plume allows a relative quantification of local degradation intensities.

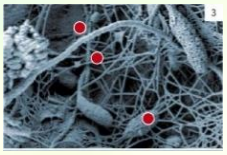


Selection

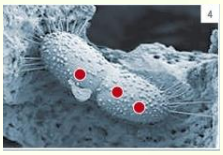
Loading



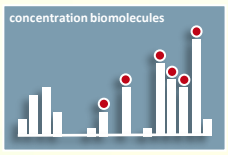
Incubation



Colonization



Assimilation

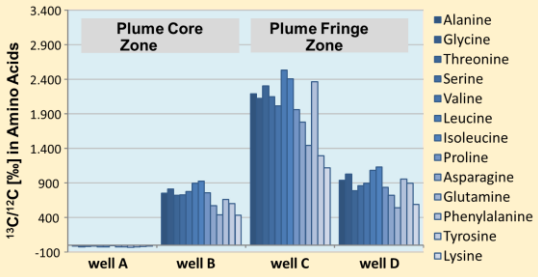


Proof

Applicable contaminants for BACTRAP approach

- **Polycyclic aromatic hydrocarbons (PAH)**
- **Gasoline additives (MTBE, ETBE, TBA)**
- **BTEX and further alkylated monoaromatic compounds**
- **Chlorinated hydrocarbons (if carbon source)**
- **Pesticides and pharmaceuticals**
- **all chemicals that can be labeled by ^{13}C**

Relative comparison in investigated plume areas



Workflow

- In a joint concept, we select target contaminants and spots of the field site to be investigated.
- We will send the BACTRAPS and easy installation protocols so that the client can deploy them at the field site. Alternatively, we set up the installation directly.
- The BACTRAPS are incubated for 1-3 months in groundwater wells depending on redox conditions.
- For removal, we provide equipment, transport boxes and protocols.
- We quantify colonizing microorganisms and analyze ^{13}C-content of biomarkers within 2 - 4 weeks.
- Our expertise provide information on *in situ* biodegradation of the target contaminant including a relative comparison of microbial activity in investigated plume areas.

Outcome
Sensitive and semi-quantitative evidence of *in situ* biodegradation

Costs
1.500 - 3.000 € per BACTRAP

Processing time
4 - 6 months

Further reading

Bahr A, Fischer A, Vogt C, Bombach P (2015): Evidence of polycyclic aromatic hydrocarbon biodegradation in a contaminated aquifer by combined application of in situ and laboratory microcosms using 13C-labelled target compounds. Water Res. 69: 100-109.

Bombach P, Nägele N, Rosell M, Richnow H H, Fischer A (2015): Evaluation of ethyl tert-butyl ether biodegradation in a contaminated aquifer by compound-specific isotope analysis and in situ microcosms. J. Hazard. Mater. 286: 100-106.

Fischer A, Manefield M, Bombach P (2016): Application of stable isotope tools for evaluating natural and stimulated biodegradation of organic pollutants in field studies. Curr. Opin. Biotechnol. 41: 99-107.

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