Influence of bacterial biomass on transport kinetics of phenanthrene

N. HACHICHO*, A. MILTNER, L.Y. WICK AND M. KÄSTNER

UFZ - Helmholtz Centre for Environmental Research Leipzig, Germany (*correspondence: nancy.hachicho@ufz.de)

Introduction

In soils, both pollutants and pollutant-degrading organisms are heterogeneously distributed. For an efficient site remediation by biodegradation, transport of either the pollutant or the microorganisms is necessary. Earlier studies show the effect of fungal hyphae on the transport of both chemicals and bacteria by fungal highways or pipelines [1]. In our study we investigated how the presence of bacterial biomass affects the diffusive transport of phenanthrene in aqueous solution in model systems (adapted from ref [2]) in the laboratory.

Phenanthrene Transport in Passive Dosing Systems

We studied the transport of phenanthrene from a silicone ring loaded with phenanthrene (source) to a larger clean silicone ring (sink). Both rings were placed in a vial containing 1 ml of medium with or without bacteria not able to degrade phenanthrene at different cell densities. After xy hours, source, sink and medium were analysed separately for phenanthrene.

Results and Discussion

The presence of bacterial biomass increased the medium's capacity for phenanthrene, but no difference in the phenanthrene contents in the source and the sink ring were found (Fig. 1). Further experiments with different soil bacteria with a range of surface properties and motilities will provide additional informationn to elucidate the role of bacterial biomass for the transport of chemicals in soil.

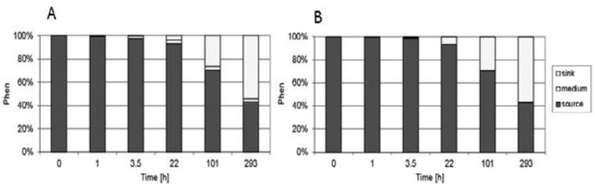

Figure 1: Phenanthrene distribution in passive dosing systems with biofilm of *Arthrobacter chlorophenolicus A6* on the surface (A) and sterile agar (B).

[1] Banitz *et al*(2012) *EnvironMicrobiolRep* 2012, 1-8. [2] Smith *et al* (2012) *Environ. Sci. Technol.* **46**, 4852–4860.

Campaign-style titanite U-Pb dating by laser-ablation ICP: Implications for crustal flow, phase transformations and titanite closure

B.R HACKER[1] A.R.C. KYLANDER-CLARK[1] T.B. ANDERSEN[2A] AND J.M. COTTLE[1]

[1]Earth Science, University of California, Santa Barbara CA 93106, USA (hacker@geol.ucsb.edu)

[2]Geosciences, Universitetet i Oslo, P.O. Box 1047 Blindern, 0316 Oslo, Norway

U-Pb dates of titanite from >150 samples of quartzofeldspathic gneiss and leucosomes were measured across the ultrahigh-pressure (UHP) Western Gneiss Region of Norway to understand deformation and metamorphism of continental crust during subduction and exhumation. Titanite is unstable at pressures > 1.5 GPa, and, indeed, most yielded post-UHP dates. A number of titanites sampled across large areas, however, have pre-UHP U-Pb dates, indicating that the titanites survived their excursion to and return from mantle depths metastably. This has three important implications. Titanite grains can remain closed to complete Pb loss during regional metamorphism at temperatures as high as 750°C and pressures as high as 3 GPa, implying that thermally mediated volume diffusion was not the principal factor controlling resetting of the U-Pb system. Phase transformations in and deformation of quartzofeldspathic rocks can be inhibited at the same conditions.

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