Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02724, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02724
EGU General Assembly 2008

Using radon as performance indicator for air sparging of dissolved BTEX-contaminated groundwater

M. Schubert, A. Schmidt, K. Müller and H. Weiß

Helmholtz Centre for Environmental Research – UFZ, Germany (michael.schubert@ufz.de / Fax: +49 341 235 2625)

At a former hydrogenation plant site (Zeitz, Saxonia Anhalt, Germany) the vadose zone and the groundwater are highly contaminated with volatile organic compounds, benzene being the main contaminant. Due to the heterogeneous geological conditions and a varying groundwater level, the contamination reaches down to a depth of over 30 m below surface. The aquifer material is made up of “braided-river” deposits, i.e. sands and gravels, intercalated by clay and lignite seams.

A BMBF-funded research project that is focussed on the assessment of potential *in situ*-groundwater remediation techniques is recently carried out at a pilot test field on the site. The evaluated remediation approaches include *in situ*-groundwater remediation by single well "air-sparging". Air-sparging is basically done by injecting a hydrocarbon-free gaseous medium (air) into the saturated zone below/within the area of contamination. Within the range of influence the contaminants that are dissolved in the groundwater partition into the injected air phase bubbling through the water. With the ascending bubbles the stripped contaminants are transported through the vadose zone. From here the contaminant vapours are pumped to a vapour extraction well and are subsequently treated on site by catalytic oxidation.

If air-sparging is used as *in-situ* remediation technique information on the range of influence of the actual stripping process and on its efficiency are essential to evaluate the measure. In order to achieve that information several in-situ measurements and hydrochemical analysis were carried out at the site. One of the parameters applied as indicator for process efficiency and range of influence was the naturally occurring

radioactive noble gas radon-222.

Radon is part of the uranium-238 decay chain and has a half-life of 3.83 days. It is continuously produced in the mineral matrix of the aquifer via α-decay of radium-226 and emanates permanently into the aquifer pore space, i.e. into the groundwater. Radon is therefore an ubiquitously occurring compound of groundwater.

The applied radon method is based on the water/air partitioning of radon, the quantitative parameters of which are known over a wide range of temperatures. The water/air partitioning coefficient (Ostwald coefficient) at temperatures to be expected in the groundwater at the site is about 0.35. That significant affinity of aqueous radon to the gaseous phase leads to a (mathematically reproducible) stripping of radon from the water into the injected air allowing the use of changes in the local radon concentration pattern in the groundwater as indicator for the range and the efficiency of contaminant removal by air-sparging. In the given case study it was revealed that, while on the one hand contaminant concentrations were significantly reduced within the range of influence of air-sparging, the range of influence was found to be much smaller then anticipated.