An anaerobic field injection experiment in a landfill leachate plume, Grindsted, Denmark: 1. Experimental setup, tracer movement, and fate of aromatic and chlorinated compounds

A continuous, natural-gradient field injection experiment, involving 18 xenobiotic compounds and bromide as tracers, was performed in the anaerobic region of a leachate plume downgradient from the Grindsted Landfill, Denmark. The injection lasted for 195 days, and within this period a continuous cloud was established. Over a period of 924 days the cloud movement was monitored in approximately 70 discrete sampling points in the central part of the cloud, and the spatial distribution was described by seven cloud snapshots involving 400-700 sampling points. The bromide cloud movement closely followed the varying flow direction predicted by the water table measurements. Moment analysis showed decreasing tracer flow velocities and reduced capture of bromide mass with time, which may be explained by varying flow conditions (direction, hydraulic gradient) and the heterogeneous geological conditions in the sandy aquifer. Naphthalene, having the highest log K-ow value, was the most retarded compound, with a retardation of less than 10%. Therefore sorption was not considered to be a significant attenuation process for any of the compounds studied. Transformation under iron-reducing conditions was observed for toluene, o-xylene, TeCM, 1,1,1-TCA, PCE, and TCE, while transformation of benzene and naphthalene was not detected in the aquifer within the time frame of this study. First-order transformation rates were in the range of 0.028-0.039 d(-1) and 0.0014-0.0028 d(-1) for the aromatic compounds toluene and o-xylene, respectively. The rates for the chlorinated aliphatic compounds, tetrachloromethane, 1,1,1-trichloroethane, tetrachloroethylene, and trichloroethylene, were >0.7 d(-1), 0.0044-0.0054 d(-1), 0.0012-0.0038 d(-1), and 0.0003-0.001 d(-1), respectively. Long lag periods and slow transformation rates were observed for some of the compounds, suggesting that lack of transformation reported in the literature may be attributable to short experimental periods in those studies.

General information
State: Published
Organisations: Department of Environmental Science and Engineering, Department of Hydrodynamics and Water Resources
Contributors: Rügge, K., Bjerg, P., Pedersen, J., Mosbæk, H., Christensen, T.
Pages: 1231 - 1246
Publication date: 1999
Peer-reviewed: Yes

Publication information
Journal: Water Resources Research
Volume: 35
Issue number: 4
ISSN (Print): 0043-1397
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.39 SJR 2.296 SNIP 1.555
Web of Science (2017): Impact factor 4.361
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.1 SJR 2.615 SNIP 1.633
Web of Science (2016): Impact factor 4.397
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.06 SJR 2.525 SNIP 1.593
Web of Science (2015): Impact factor 3.792
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.75 SJR 2.442 SNIP 1.668
Web of Science (2014): Impact factor 3.549
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.65 SJR 2.204 SNIP 1.751
Web of Science (2013): Impact factor 3.709
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.12 SJR 2.127 SNIP 1.586
Web of Science (2012): Impact factor 3.149
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.92 SJR 1.937 SNIP 1.48
Web of Science (2011): Impact factor 2.957
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.053 SNIP 1.431
Web of Science (2010): Impact factor 2.737
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.138 SNIP 1.528
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.814 SNIP 1.546
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.695 SNIP 1.44
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.794 SNIP 1.704
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.73 SNIP 1.402
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.644 SNIP 1.463
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.923 SNIP 1.758
Scopus rating (2002): SJR 1.725 SNIP 1.943
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.091 SNIP 1.635
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 2.726 SNIP 1.774
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 2.74 SNIP 1.88
Original language: English
DOIs:
10.1029/1998WR900101
Source: orbit
Source-ID: 172917
Research output: Research - peer-review › Journal article – Annual report year: 1999