Hydrogen and Carbon Isotope Fractionation during Anaerobic Biodegradation of Aromatic Hydrocarbons– A Field Study

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Table 1. Concentrations and stable carbon as well as stable hydrogen isotope signatures of selected aromatic hydrocarbons for groundwater samples at the site taken in November 2000 ($\delta^{13}C$) and March 2001 ($\delta^{2}H$).

well	toluene		*o*-xylene		*o*-xylene		*p, m*-xylene	
	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)	concn.[a] (µg/L)	$\delta^{2}H$ (‰ SMOW)	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)
B14	1050 ± 90	–24.9 ± 1.0	579 ± 60	–25.3 ± 0.5	579 ± 60	–135 ± 6	1014 ± 110	–24.1 ± 0.7
B15	6607 ± 518	–25.3 ± 0.3	1107 ± 200	–25.3 ± 0.3	1107 ± 200	–95 ± 6	2254 ± 184	–25.0 ± 0.7
B22	2063 ± 210	–24.8 ± 0.5	1324 ± 150	–24.2 ± 0.7	1324 ± 150	–111 ± 9	2608 ± 214	–23.8 ± 0.5
B27	-	< d.l.	2 ± 1	–13.6 ± 0.6	-	< d.l.	2 ± 1	–13.8 ± 0.9
B28	-	< d.l.	-	< d.l.	-	< d.l.	2 ± 1	–13.6 ± 2.3
B42	-	< d.l.	-	< d.l.	-	< d.l.	-	< d.l.
B44	-	< d.l.	58 ± 7	–19.7 ± 0.7	58 ± 7	–92 ± 10	39 ± 3	–18.5 ± 0.5
B47	-	< d.l.	20 ± 3	–16.7 ± 1.0	20 ± 3	–42 ± 12	18 ± 2	–13.5 ± 1.6
B48	16 ± 2	–14.4 ± 0.8	36 ± 3	–19.7 ± 0.3	36 ± 3	–32 ± 10	27 ± 3	–17.0 ± 1.2
B49	-	< d.l.	39 ± 3	–18.8 ± 0.8	39 ± 3	–34 ± 11	28 ± 3	–18.9 ± 0.9
B54	-	< d.l.	7 ± 1	–16.8 ± 1.8	-	< d.l.	3 ± 3	–21.9 ± 0.8
B55	100 ± 7	–21.6 ± 0.5	72 ± 8	–21.9 ± 1.0	72 ± 8	–133 ± 13	142 ± 15	–21.8 ± 0.6
B56	173 ± 20	–21.9 ± 0.9	228 ± 20	–24.3 ± 0.8	228 ± 20	–115 ± 5	268 ± 30	–22.7 ± 0.7
B57	-	< d.l.	43 ± 4	–18.1 ± 0.6	43 ± 4	–63 ± 16	30 ± 3	–18.6 ± 1.3

well	2-methylnaphthalene		1-methylnaphthalene		methylbenzofuran[b]		acenaphthene	
	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)	concn. (µg/L)	$\delta^{13}C$ (‰ VPDB)
B14	822 ± 90	–24.4 ± 0.7	1004 ± 120	–24.1 ± 0.7	179 ± 19	–19.8 ± 0.5	482 ± 45	–23.6 ± 0.6
B15	1030 ± 108	–23.5 ± 0.3	958 ± 94	–23.4 ± 1.8	489 ± 48	–20.7 ± 1.9	920 ± 92	–22.7 ± 1.4
B22	279 ± 30	–22.7 ± 1.6	421 ± 35	–24.1 ± 1.5	226 ± 18	–20.4 ± 1.4	582 ± 51	–23.3 ± 1.6
B27	-	< d.l.	-	< d.l.	62 ± 6	–20.4 ± 0.3	211 ± 17	–24.4 ± 0.3
B28	-	< d.l.	-	< d.l.	30 ± 4	–20.7 ± 0.8	181 ± 18	–24.5 ± 0.8
B42	-	< d.l.	-	< d.l.	3 ± 1	–20.4 ± 1.1	148 ± 10	–23.7 ± 0.3
B44	-	< d.l.	213 ± 18	–23.9 ± 0.7	84 ± 7	–20.3 ± 0.8	214 ± 17	–23.7 ± 0.3
B47	-	< d.l.	43 ± 6	–22.4 ± 0.8	169 ± 15	–20.7 ± 0.5	400 ± 33	–24.0 ± 0.5
B48	12 ± 2	–20.4 ± 0.4	207 ± 21	–23.8 ± 0.3	206 ± 22	–20.8 ± 0.6	463 ± 42	–24.0 ± 0.3
B49	-	< d.l.	410 ± 45	–24.5 ± 0.6	146 ± 14	–20.6 ± 0.7	541 ± 46	–23.7 ± 0.3
B54	-	< d.l.	32 ± 2	–23.8 ± 0.5	137 ± 11	–21.0 ± 0.4	278 ± 25	–23.7 ± 0.9
B55	25 ± 3	–21.7 ± 0.6	35 ± 4	–23.8 ± 0.4	37 ± 5	–20.4 ± 0.3	522 ± 44	–24.0 ± 0.3
B56	91 ± 10	–22.6 ± 0.5	437 ± 46	–24.4 ± 0.8	149 ± 11	–19.8 ± 0.8	495 ± 45	–23.6 ± 0.3
B57	-	< d.l.	148 ± 12	–24.2 ± 0.3	99 ± 8	–21.0 ± 0.4	193 ± 19	–23.8 ± 0.3

[a] = concentrations derive from the November sampling campaign (see manuscript text).

[b] = isomer not identified.

< d.l. = below detection limit for isotope analysis.

- = not detected.