

BACKGROUND LEVELS OF PCDD/F IN AMBIENT AIR, PARTICULATE MATTER AND DEPOSITION IN GERMANY

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1. Introduction

In Germany an integrated monitoring network has been installed by the Federal Environmental Agency to evaluate the present situation as well as long-term changes in ambient air, deposition and soil. All sampling sites are located in rural districts of Germany to investigate the influence of the long-range transportation of air pollutants (Umweltbundesamt 1999). During 2 sampling campaigns, 1994/95 in the western and 1996/97 in the eastern part of Germany at each site air, particulate matter, deposition and soil samples were taken. All samples were analysed for PCDD/F, PCB, chlorinated pesticides and VOC (Knoth et al.). – A map of the sampling sites and the results of the analysis of PCDD/F in soil have been already presented (Rotard et al. 1994; Knoth et al. 1999).

Keywords: Polychlorinated dibenzo-p-dioxins and dibenzo-furans; International toxic equivalents; I-TEQ; Immission samples; Precipitation; Total Suspended Particulate Matter; TSP; Bulk sampler with adsorption cartridge

2. Material and Methods

Air sampling was carried out using the small filtering method (VDI 3498) (constant flow rate 2 m³/h, sampling period 30 d, glass fiber filter, D 40.5 mm and 2 PUF plugs, D 55 mm, H 50 mm). Filters and PUF plugs of the first and the second half-year were pooled. – For particulate matter a part of the daily changed filter of the high volume samplers was extracted (VDI 2463) (flow rate 60 m³/h, sampling period 1 d, glass fiber filter D 140 mm, part filter D 31.8 mm). The collected filters of the first and the second half-year were extracted together. – 26 bulk samplers with adsorption cartridge were installed for deposition sampling (Löbner-Liesegang sampler (VDI 2119) modified with adsorption cartridge). The adsorption cartridge was changed after 6 months. An improved type of the sampler is presented in Fig. 1 (Bulk sampler) and Fig. 2 (Adsorption cartridge). – Extraction and clean-up was performed as previously described (VDI 3498).

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Table 1

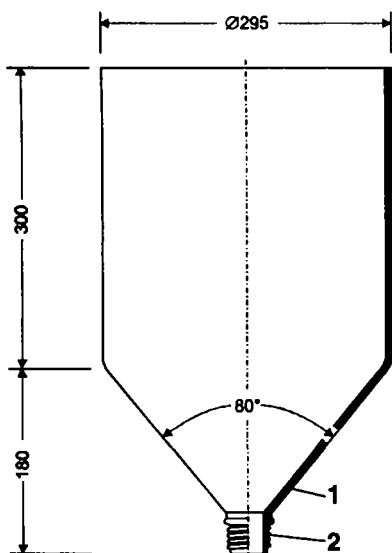
Background Levels of PCDD/F in Ambient Air, Particulate Matter and Deposition in Germany

Sampling Site	Sampling Period		Ambient Air		Part. Matter		Deposition	
	A	B	A	B	A	B	A	B
			[fg I-TEQ/m ³]		[fg I-TEQ/m ³]		[pg I-TEQ/m ² d]	
Angermünde	3/97-8/97	8/96-3/97					1,7	3,2
Ansbach	3/94-9/94	9/94-3/95			6,5	26,9	2,1	2,4
Bassum	2/94-8/94	8/94-2/95			10,9	24,5	2,7	3,7
Brotjackriegel	3/94-9/94	9/94-3/95	4,0	8,6	6,4	11,7	2,5	6,6
Deuselbach	2/94-8/94	8/94-2/95	19,6	23,8	12,1	14,9	3,0	4,7
Gartow	3/94-8/94	8/94-3/95					1,7	2,6
Gittrup	2/94-8/94	8/94-2/95					3,8	6,2
Herleshausen	2/94-8/94	8/94-2/95					2,6	6,8
Hohenwestedt	4/94-10/94	10/94-4/95			5,8	11,2	2,0	4,9
Leinefelde	2/97-8/97	8/96-2/97					17,9	13,3
Lindenberg	3/97-8/97	8/96-3/97					2,8	2,1
Meinerzhagen	2/94-8/94	8/94-2/95			12,5	19,5	8,6	14,5
Melpitz		8/96-3/97						3,0
Neuglobsow		8/96-3/97	4,4	27,4				1,9
Regnitzlosau	3/94-9/94	9/94-3/95					1,4	3,3
Rodenberg	3/94-8/94	8/94-3/95					2,8	5,2
Rottenburg	3/94-9/94	9/94-3/95			20,2	8,3	2,7	1,5
Schauinsland	3/94-9/94	9/94-3/95	5,0	7,6	6,6	8,6	6,8	6,5
Schmücke	2/97-8/97	8/96-2/97	5,8	11,7			4,7	8,5
Stamberg	3/94-9/94	9/94-3/95			6,8	10,6	3,2	2,9
Ueckermünde	3/97-8/97	8/96-3/97					2,1	2,9
Usingen	1/94-7/94	7/94-1/95					3,1	3,3
Waldhof	3/94-8/94	8/94-3/95	14,8	14,2	7,3	18,9	2,1	2,7
Westerland	4/94-10/94	10/94-4/95	6,6	13,1	7,5	18,4	1,9	3,4
Wiesenburg	3/97-8/97	8/96-3/97					1,5	2,5
Zingst	3/97-8/97	8/96-3/97	6,3	15,8			1,2	1,7
Min.			4,0	7,6	5,8	8,3	1,2	1,5
Max.			19,6	27,4	20,2	26,9	17,9	14,5
Mean			8,3	15,3	9,3	15,8	3,5	4,6
50-Perz.			6,1	13,7	7,3	14,9	2,6	3,3
90-Perz.			16,2	24,9	12,5	24,5	6,2	7,6
10-Perz.			4,3	8,3	6,4	8,6	1,5	2,0

ORGANOHALOGEN COMPOUNDS

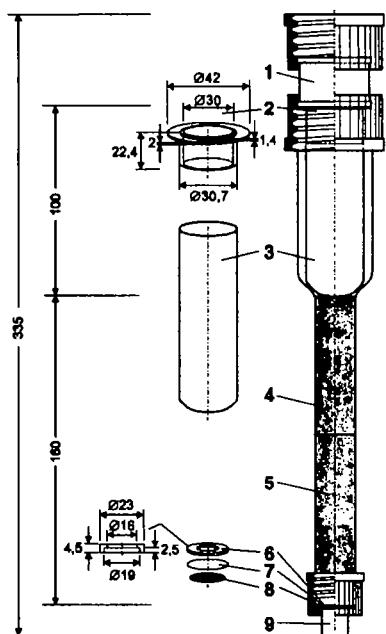
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- 1 Funnel made from a laboratory bottle, borosilicate glass, capacity 20 l, Cat. No. 21 801 91, Schott, Mainz, without bottom, edge fused, sampling area 0.057 m²
- 2 DIN thread GL 45

Fig. 1. Bulk Sampler.



- 1 Screw thread adapter coupling for 2 x GL 45, PTFE/PBTP, Cat. No. H 901-05, Bohlender, Lauda-Königshofen
- 2 Adapter, PTFE
- 3 Glass fiber soxhlet extraction thimble, type 603 gh, ID 30 mm, H 100 mm, Cat. No. 37 15 36, Schleicher & Schuell, Dassel
- 4 Screw thread tube with 2 DIN thread GL 45 - GL 25, borosilicate glass
- 5 PUF plug, D 22 mm, H 76 mm, precleaned, 2 pieces, Cat. No. 2-0600, Supelco, Deisenhofen
- 6 Filter cassette, PTFE
- 7 Cellulose nitrate filter, pore size 3.0 μ m, D 25 mm, Cat. No. 11 302-025 N, Sartorius, Göttingen
- 8 Stainless steel frit, pore size 10 μ m, D 3/4", thickness 1/16", Cat. No. A-336-02, Upchurch, Oak Harbor, USA
- 9 Chromatography adapter, PTFE/PBTP, aperture D 0.8 mm, GL 25 - UNF 1/4" 28 G, Cat. No. F 755-09, Bohlender, Lauda-Königshofen

Fig. 2. Adsorption Cartridge.

3. Results and Discussion

Highest PCDD/F values were found during the sampling period autumn/winter ranging from 7.6 to 27.4 fg/I-TEQ m³ (50-Perz. 13.7) in ambient air and from 8.3 to 26.9 (50-Perz. 14.9) in particulate matter. During spring/summer the PCDD/F values are lower. They range from 4.0 to 19.6 (50-Perz. 6.1) in ambient air and from 5.8 to 20.2 (50-Perz. 7.3) in particulate matter. – The deposition values are nearly the same in autumn/winter as in spring/summer ranging from 1.5 to 14.5 (50-Perz. 3.3) respectively 1.2 to 17.9 pg/I-TEQ m²d (50-Perz. 2.6). – The total deposition of PCDD/F in Germany is estimated at 160 to 2400 g I-TEQ/a (50-Perz. 340 g) (Deposition Min., Max. or 50-Perz. pg I-TEQ/m²d*Area of Germany 3.6*10¹¹ m²*365 d).

Acknowledgements

We would like to thank Mr. H. Schiege, V. Schinz, U. Stang, Mrs. S. Bönsel and the staff of the UBA Air Monitoring Network for sampling and Mrs. A. Gramzow, P. Kutschera, T. Kalefe, S. Dornhöfer and J. Nebhuth for extraction and clean-up of the samples and Mrs. M. Jung for drawing Fig. 1 and 2.

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