

ENVIRONMENTAL LEVELS II -POSTER

DISTRIBUTION OF PCDDs/PCDFs IN SEDIMENT SAMPLES FROM KOREA

SEONG KI JANG, YOUNG HEE CHUNG, KIL CHUL LEE, DOUG IL CHOI

National Instituted of Environmental Research, Sudokwon Landfill 2-1 Environmental Complex Kyunseedong, Seogu, Incheon 404-170, Korea

INTRODUCTION

Recently, PCDDs and PCDFs have been greatly concerned because of the their toxicity and persistency in the environment[1~4]. Many studies indicated that PCDDs, PCDFs and other persistent organochlorines are widespread in sediment, soil, water and air. PCDDs/PCDFs have been accumulated in sediment from water environment because these compounds have very low solubility.

This paper presents the results of PCDDs/PCDFs distribution levels in sediments. The analytical methods have been applied to 11 samples and laboratory blank and to examine the levels and patterns of 2,3,7,8-substituted PCDDs/PCDFs.

EXPERIMENTAL METHODS

Instrumental Analysis : High resolution gas chromatography/high resolution mass spectrometry(HRGC/HRMS) was operated under the selected ion monitoring (SIM) mode. The mass resolution was 10,000 and GC columns were DB-5MS and SP-2331. The operating condition was presented in Table 1.

Table 1. The Analytical Conditions of PCDDs/PCDFs

Low chlorinated PCDDs/PCDFs (tetra- to penta-)	High chlorinated PCDDs/PCDFs (hexa- to octa-)
High polar column : SP2331 60m× 0.32mm ID× 0.2 μm	Non polar column : DB5 30m× 0.32mm ID× 0.2 μm
120 °C(1min, 10 °C/min) → 200 °C(2min, 3 °C/min) → 260 °C(20min)	100 °C(1min, 30 °C/min) → 200 °C(1min, 10 °C/min) → 300 °C(20min)
Injector Temp. : 260 °C Injection : Splitless Purge Off Tme : 60sec	Injector Temp. : 280 °C Injection : Splitless Purge Off Tme : 60sec

ENVIRONMENTAL LEVELS II -POSTER

Sample Treatment : The experimental procedure showed in Figure 1. Samples were extracted by the soxhlet and toluene was used to the extraction solvent. The detection limits were surveyed 1 pg/g for tetra-/penta-, 2 pg/g for hexa-/hepta- and 5 pg/g for octa-PCDDs/PCDFs.

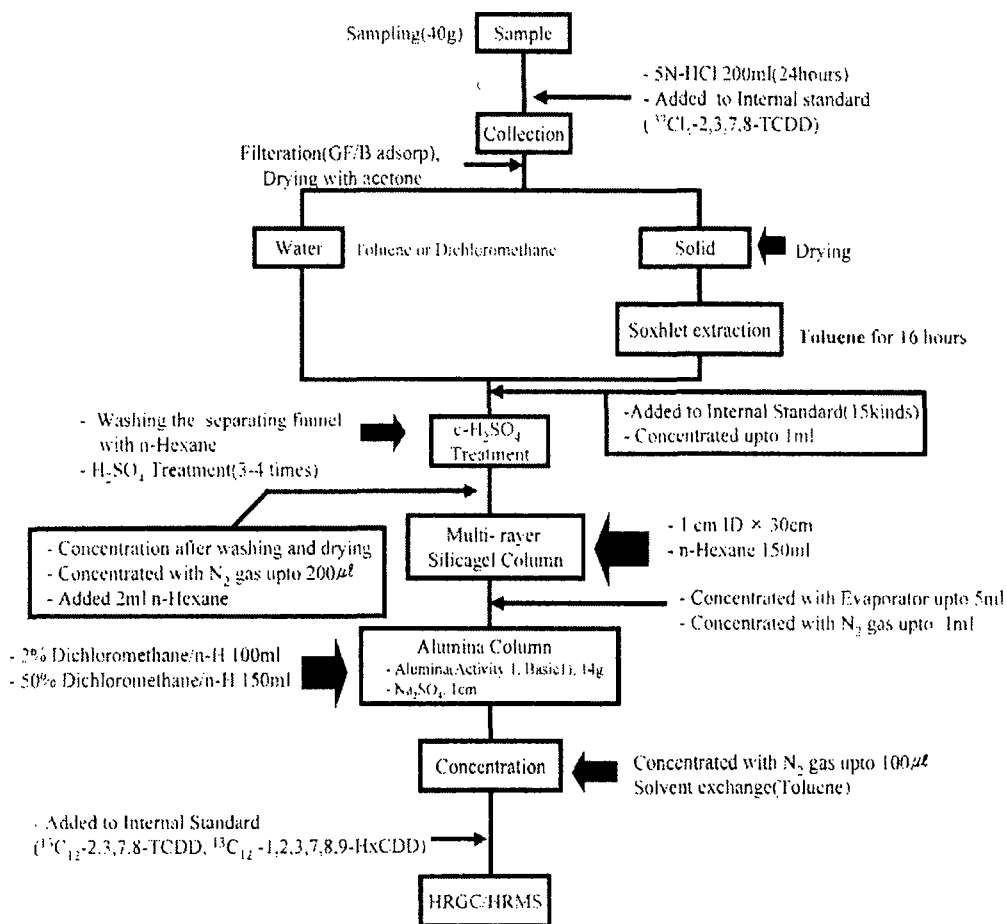


Figure 1. Pretreatment and Analytical Flowchart of Sediment Sample

RESULTS AND DISCUSSION

Accumulation of PCDDs/PCDFs : The analytical results of PCDDs/PCDFs showed in Table 2 for congener concentration and Table 3 for toxic equivalent concentration. The congener concentration was detected between N.D and 201.715 pg/Dry weight g, and TEQ was detected between N.D and 0.984 pg-TEQ/g.

ORGANOHALOGEN COMPOUNDS

ENVIRONMENTAL LEVELS II --POSTER

Table 2. TEQ Concentration of PCDDs/PCDFs in 11 Sampling Points

Unit : pg-TEQ/g(dry)

Congener	Measuring site										
	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11
2,3,7,8-TCDF	0.017	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	0.508	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpCDF	0.081	ND	ND	ND	ND	0.069	ND	ND	0.042	ND	ND
1,2,3,4,7,8,9-HpCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OCDF	0.006	ND	ND	ND	ND	ND	ND	ND	0.006	ND	ND
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpCDD	0.109	ND	0.029	ND	ND	0.173	ND	ND	0.066	ND	ND
OCDD	0.173	0.015	ND	ND	ND	0.186	ND	ND	0.063	ND	ND

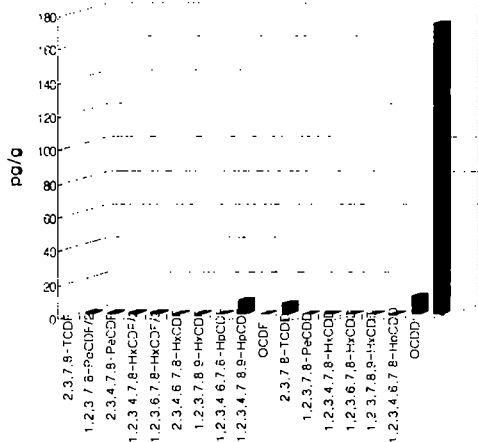
Table 3. Congener Concentration of PCDDs/PCDFs in 11 Sampling Points

Unit : pg/g(dry)

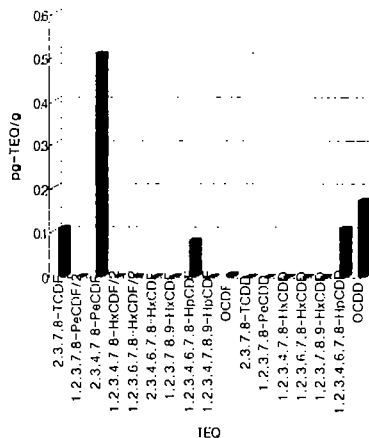
Congener	Measuring site										
	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11
2,3,7,8-TCDF	1.066	ND	ND	0.791	ND	0.827	0.982	ND	ND	ND	ND
1,2,3,7,8-PeCDF	0.673	ND	ND	ND	0.271	0.395	0.425	ND	ND	ND	ND
2,3,4,7,8-PeCDF	1.015	ND	ND	ND	ND	0.607	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDF	0.83	ND	ND	ND	ND	0.762	ND	ND	1.003	ND	ND
1,2,3,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpCDF	8.092	ND	ND	ND	ND	6.938	ND	ND	4.218	ND	ND
1,2,3,4,7,8,9-HpCDF	ND	ND	ND	ND	ND	1.54	ND	ND	ND	ND	ND
OCDF	6.009	ND	ND	ND	ND	4.802	ND	ND	6.357	ND	ND
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpCDD	10.92	1.815	2.875	ND	ND	17.26	ND	ND	6.603	ND	ND
OCDD	173.1	14.55	ND	ND	ND	186.3	ND	ND	63.31	ND	ND

ENVIRONMENTAL LEVELS II -POSTER

Detected Isomer Patterns : The detected isomer patterns showed in Figure 2. As shown in Figure 2 (a), the OCDD, 1,2,3,4,6,7,8-HpCDD, 2,3,7,8-TCDD and 1,2,3,4,7,8,9-HpCDF were detected, and the OCDD was especially accounted for 90% of total detecting isomers. In Figure 2 (b), 2,3,4,7,8-PeCDF, 2,3,7,8-TCDF, 1,2,3,4,6,7,8-HpCDF, OCDD and 1,2,3,4,6,7,8-HpCDD were detected.



(a) Congener profile



(b) TEQ

Figure 2. Detected Patterns of PCDDs/PCDFs in Sampling Point D-1

CONCLUSION

Some kinds of isomers were detected as explained previous section. The PCDDs detected over 90% of the total detecting PCDDs/PCDFs congener isomers. The sediment was polluted with 2,3,4,7,8-PeCDF, 2,3,7,8-TCDF, 1,2,3,4,6,7,8-HpCDF, OCDD and 1,2,3,4,6,7,8-HpCDD isomers.

REFERENCE

1. P. J. Landrigan, General Population exposure to Environmental Concentration of Halogenated Biphenyls, Elsevier North Holland, New York., 1980.
2. J. Falandysz, Polychlorinated biphenyls(PCBs) in the Environment, 1 ~ 265(1988).
3. K. P. Kringstad, and K. Lindstrom, *Environ. Sci. Technol.*, 18, 236A, (1984).
4. S. K. Shin et. Al., 18th Dioxin Symposium in Sweden, Vol. 36, 307~311, (1998).