DISTRIBUTION OF PCDDs/PCDFs IN WATER SAMPLES FROM KOREA

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INTRODUCTION

Chlorinated organics compounds such as polychlorinated dibenzofurans, polychlorinated dibenzo-p-dioxins, polychlorinated biphenyls, and pesticides and so on, have highly toxic and very persistent in the environment[1,2]. The polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs) are formed during incomplete combustion and released as unknown by-products of industrial process [3]. These compounds were transported from atmosphere to water, soil and animals, and accumulated to the matrixes. Also, the compounds were accumulated to human by food chain. Therefore, the concentrations of PCDDs/PCDFs in environments were very importants to bioaccumulate the human body.

In this research, 43 samples were collected and analyzed the PCDDs/PCDFs to examine the distribution of 2,3,7,8-substituted PCDDs/PCDFs in water environment.

EXPERIMENTAL METHODS

The analytical condition was represented in previous papers[4]. The analytical procedure of liquid sample showed in Figure 1. The detection limits were surveyed 0.1 pg/l for tetra-/penta-, 0.2 pg/l for hexa-/hepta- and 0.5 pg/l for octa-PCDDs/PCDFs.

RESULTS AND DISCUSSION

Analytical Results : The analytical results of collected water samples were represented in Table 1. The average concentration was examined 0.056 pg-TEQ/ℓ , and the highest concentration was represented to 0.502 pg-TEQ/ℓ in sampling point W-21. The detected concentration of congeners was reported from N.D to 17.809 pg/g in sampling point W-36. The highest concentration between TEQ values and congener concentration was reported differently. These phenomena could be explained by difference of the detected OCDD concentration. The sampling point of W-36 was detected high congener concentration comparing to the sampling point W-26, but the TEF value of OCDD low, therefor the contribution of TEQ value was low. The congener concentration represented in Table 2.

The internal standard recoveries of 2,3,7,8-substited isomers were obtained between 78% and 90%, which was satisfied the EPA method(40~135%), JIS method(50~120%) and Korean official method(50~120%).

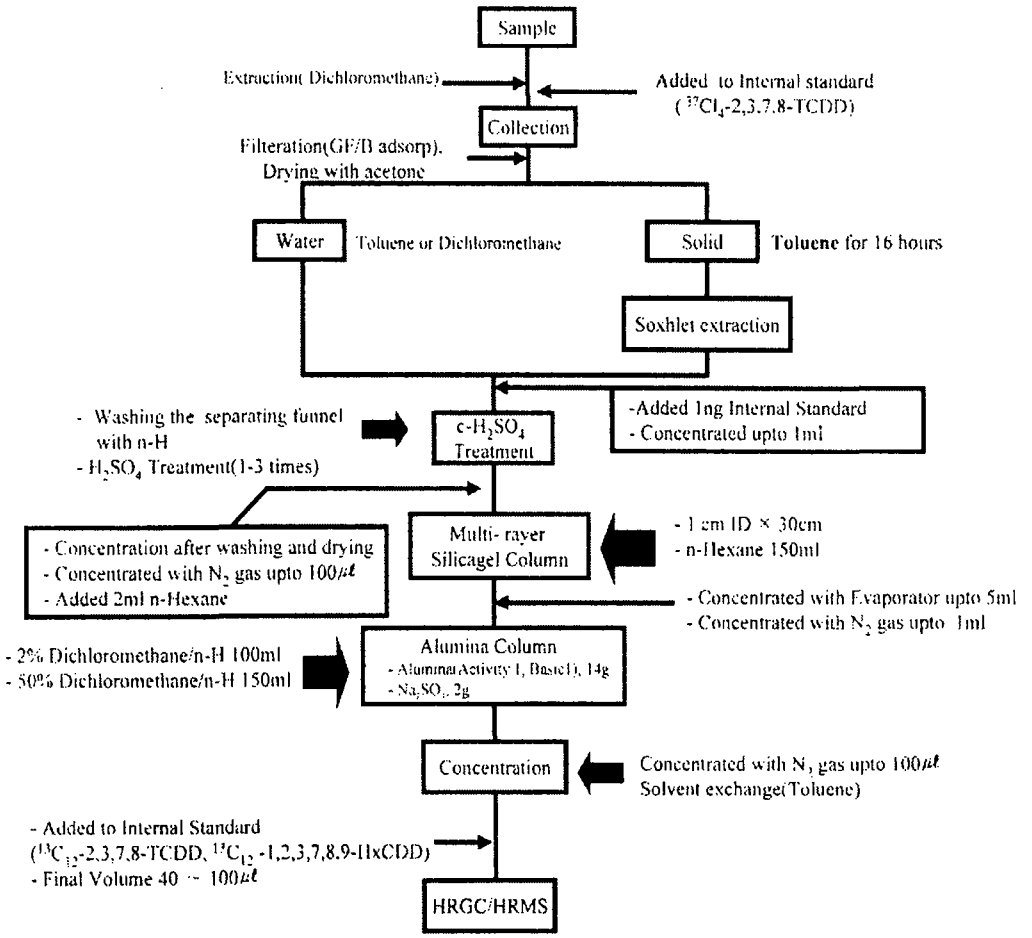


Figure 1. Flowchart of PCDDs/PCDFs in Water Samples

Distribution of PCDDs/PCDFs : The distribution of PCDDs/PCDFs in the highest detected sample were represented in Figure 1(W-36) and 2(W-21). The Figure 1 was represented in the 2,3,7,8-congener profiles, and Figure 2 was represented the 2,3,7,8-TEQ profile. The OCDD and 1,2,3,4,6,7,8-HpCDD were mainly detected as shown in Figure 2 (a). The 2,3,4,7,8-PeCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,7,8-HxCDF and 1,2,3,7,8-PeCDD were detected as shown in Figure 2 (b), and the 17 kinds of isomers were detected.

CONCLUSION

In water sample, PCDDs were more detected in the congener profiles of PCDDs/PCDFs. PCDFs were more detected in TEQ profiles, and 2,3,4,7,8-PCDF was mainly detected. These patterns are similar to the incineration patterns of PCDDs/PCDFs.

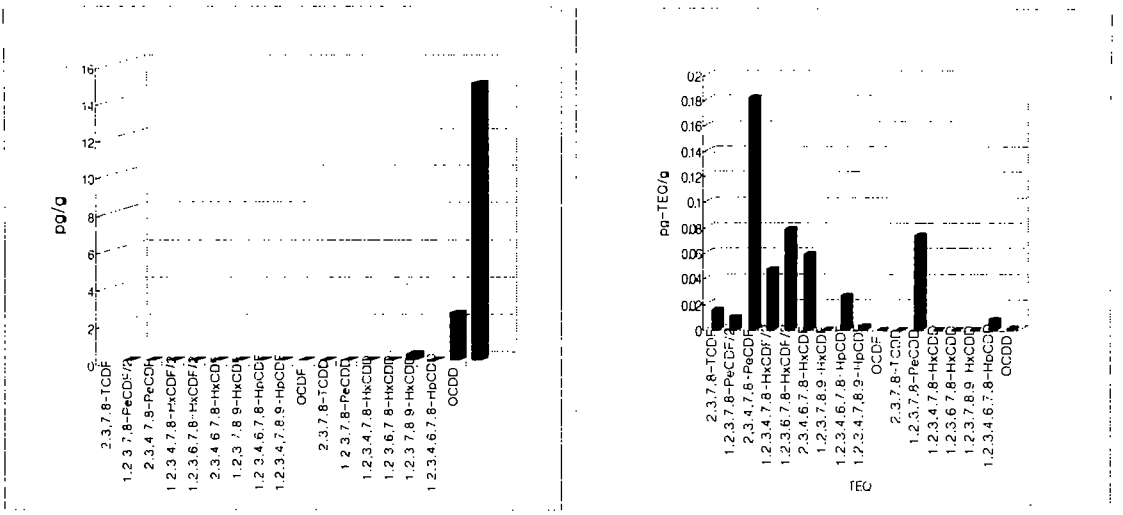
Table 1. TEQ Concentration of PCDDs/PCDFs In Water Samples

Unit : pg-TEQ/ℓ

Sample	Concentration	Sample	Concentration	Sample	Concentration
W-1	0.003	W-16	0.108	W-31	0.023
W-2	0.010	W-17	0.097	W-32	0.008
W-3	0.374	W-18	ND	W-33	ND
W-4	0.025	W-19	0.060	W-34	0.001
W-5	0.060	W-20	0.001	W-35	0.005
W-6	0.353	W-21	0.502	W-36	0.075
W-7	0.001	W-22	0.067	W-37	0.005
W-8	0.474	W-23	0.009	W-38	0.003
W-9	0.001	W-24	0.007	W-39	0.002
W-10	0.001	W-25	0.001	W-40	ND
W-11	0.006	W-26	0.005	W-41	0.001
W-12	ND	W-27	ND	W-42	0.019
W-13	0.068	W-28	0.003	W-43	0.006
W-14	ND	W-29	0.009	-	
W-15	0.003	W-30	0.011	-	

Table 2. Congener Concentration of PCDDs/PCDFs In Water Samples **Unit : pg/ℓ**

Sample	Concentration	Sample	Concentration	Sample	Concentration
W-1	0.989	W-16	4.387	W-31	10.104
W-2	2.713	W-17	4.406	W-32	3.941
W-3	14.694	W-18	ND	W-33	ND
W-4	1.273	W-19	2.406	W-34	0.792
W-5	3.116	W-20	0.607	W-35	2.399
W-6	16.905	W-21	7.688	W-36	17.809
W-7	0.880	W-22	4.577	W-37	2.219
W-8	20.577	W-23	2.388	W-38	2.834
W-9	0.711	W-24	2.243	W-39	2.440
W-10	0.590	W-25	0.820	W-40	ND
W-11	1.268	W-26	3.073	W-41	0.753
W-12	ND	W-27	ND	W-42	2.742
W-13	1.393	W-28	1.711	W-43	1.454
W-14	ND	W-29	3.154	-	
W-15	1.673	W-30	4.677	-	



(a) Congener profile(W-36) (b) TEQ Value(W-21)

Figure 2. Distribution of 2,3,7,8-Isomers

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