

ENVIRONMENTAL LEVELS II -POSTER

DISTRIBUTION OF PCBs IN INCHON COASTAL SEDIMENT

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Abstract

The residue levels of total PCBs in the surface samples were detected low concentration compared to the coastal area in Korea, and the PCBs pattern were very similarly to the arochlor mixture(1016+1232+1248+1260). The selected area divided into three area (Kanghwa:A, Yellow:B and Jangdo:C) by depending on the chlorine ratio. The PCBs were mainly detected dichlorinated and trichlorinated biphenyls in far sea, and heptachlorinated and octachlorinated biphenyls in the near the Incheon coastal area. The residue levels of PCBs were detected 0.72 ~ 9.20ng/g in the surface samples, 1.60 ~ 3.00ng/g for Kanghwa and 0.34 ~ 9.20ng/g for Jangdo in the core samples, and the PCBs concentration increased from bottom to top.

Introduction

Polychlorinated biphenyls (PCBs), have become widely dispersed in the environment and their residues have been detected in agricultural, biological, and environmental samples around world[1]. Also, PCBs have been found in nearly all marine plant and animal specimens, fish, mammals, birds and humans. Recently, PCBs are well known to the endocrine disruptor compounds (EDCs) and persistent organic pollutants (POPs) due to their toxicities and carcinogenic potential and ability to interfere with reproductive systems. [1,2,3].

In this paper, we analyzed the costal sediment samples using Aroclor 1242+1248+1254 +1260(1:1:1:1) standard, which used in korea very widely over the past years. Eight samples analyzed to see the patterns of PCBs isomer, and also the levels measured.

Experimental Methods

Sampling and Pretreatment : The sediments were treated as shown in Figure 1. Eight samples were collected in near Inchon coastal area. The homogenized samples were extracted using ASE at 100°and 150psi.

Analytical Condition : The Arochlor 1242:1248:1254:1260(1:1:1:1) standard prepared to evaluated the PCB levels in sediment as shown in Figure 2. The instrument consisted of a Varian 3800CX GC/MS and Micromass HRGC/HRMS equipped with split injector, and a 60 meter DB-5MS column (60m×0.32mm ID×3.0µm). The GC oven temperature program was 100°C for 3min, temperature-ramped to 180°C at 7°C/min, then 280°C at 3°C/min and held for 13 min.

Results and Discussion

The 127 kinds of PCB isomer were separated as shown in Figure 1. From these results, eight

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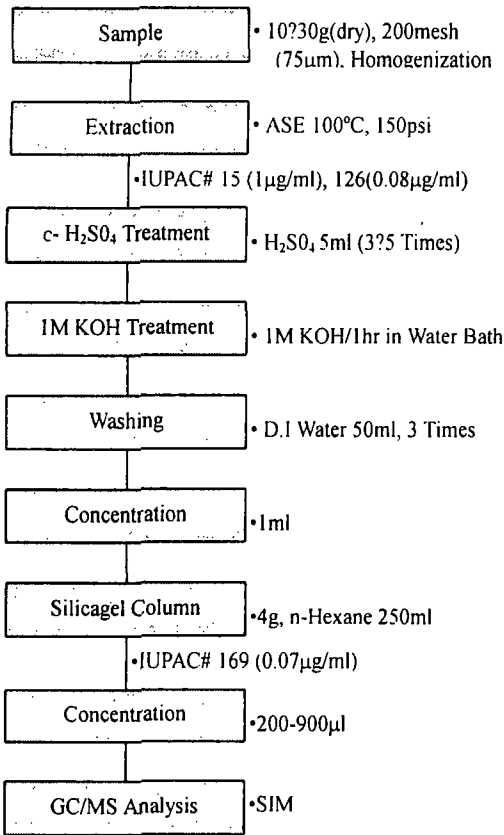


Figure 1. Analytical Procedure

sediments were analyzed to the congener profiles(1Cl~9Cl) and examined the accumulated levels of coplanar PCBs.

Residue Concentration of PCB congeners in samples : Eight sediment samples at three area(A, B, C) were collected in near Inchon coastal sites. The residue concentration of PCBs are showed in the Table 1. The residue levels of PCBs were detected 0.72~9.20ng/g in the surface samples, 1.60~3.00ng/g for Kanghwa and 0.34~9.20ng/g for Jangdo in the core samples.

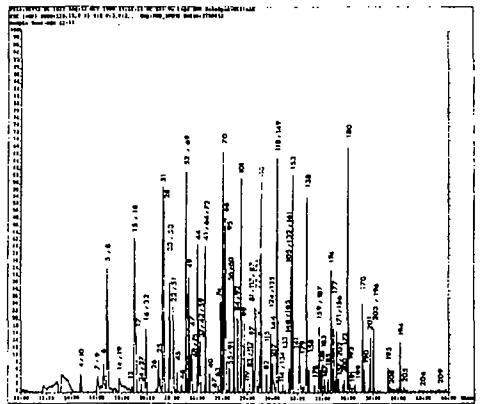


Figure 2. PCBs Standards

The highest PCB concentration was detected at point 6, which located in outlet of leachate, and the highest detected PCBs isomers was examined tetrachlorinated biphenyl, which was detected the 2.29ng/g.

Table 1. Residue Concentration of PCBs

	(dry, ng/g)								
	1Cl	2Cl	3Cl	4Cl	5Cl	6Cl	7Cl	8Cl	9Cl
Point 1	ND	0.29	0.67	0.69	0.51	0.44	0.42	0.07	ND
Point 2	ND	0.11	0.30	0.32	0.28	0.24	0.29	0.04	ND
Point 3	ND	0.09	0.22	0.20	0.15	0.14	0.17	0.02	ND
Point 4	ND	0.24	0.49	0.49	0.29	0.25	0.29	0.04	ND
Point 5	ND	0.13	0.42	0.38	0.21	0.19	0.22	0.04	ND
Point 6	ND	0.71	1.71	2.29	1.59	1.23	1.34	0.30	0.02
Point 7	ND	0.13	0.40	0.44	0.19	0.17	0.19	0.04	ND
Point 8	ND	0.10	0.18	0.23	0.09	0.06	0.09	ND	ND

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PCB Profiles: The PCB profile was surveyed in samples as shown in Table 2. As shown in Table 2, the 90% of detected PCB congeners were consisted of tri-, tetra-, penta-, hexa- and heptachlorinated biphenyls in samples. But, some PCBs isomer peaks were overlapped, therefore to evaluate the concentration and examine the accumulated mechanism, we should have to develop the analytical technique. Thirteen kinds of coplanar PCB isomers (IUPAC No. 8,18,28,52,44,66,101,118,138,153,158,180,187) were detected in samples, and the concentration profile in sampling point No. 6 represented in Figure 2.

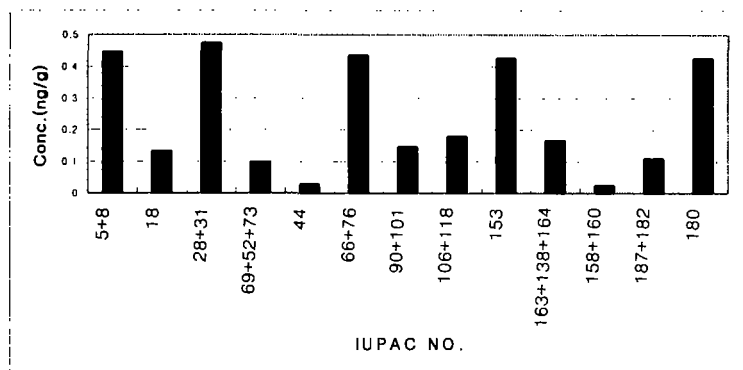


Figure 2. Coplanar-PCBs Profiles in Point 6

Vertical Distribution of PCB Concentration : The Vertical distribution of PCB concentration in sampling point 6 was analyzed as shown in Table 3. The PCBs concentration increased from bottom to top.

Table 3. PCBs Residue Concentration in Sediment(dry, ng/g)

Cl No.	1Cl	2Cl	3Cl	4Cl	5Cl	6Cl	7Cl	8Cl	9Cl
Point 6(0-1cm)	ND	0.71	1.71	2.30	1.59	1.23	1.34	0.30	ND
Point 6(1-2cm)	ND	0.35	1.36	1.54	1.02	0.81	0.72	0.13	ND
Point 6(2-3cm)	ND	0.26	1.07	1.28	0.89	0.71	0.58	0.12	ND
Point 6(3-4cm)	ND	0.25	0.69	0.88	0.74	0.65	0.44	0.04	ND
Point 6(4-10cm)	ND	0.23	0.85	1.22	0.89	0.58	0.25	ND	ND
Point 6(<10cm)	ND	0.09	0.14	0.09	0.03	ND	ND	ND	ND

ACKNOWLEDGEMENTS

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ORGANOHALOGEN COMPOUNDS

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Table 2. Congener Residue Concentration of Sampling Points

(Unit : dry, ng/g)

	IUPAC No	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	
2Cl	7+9				0.012		0.034			
	5+8	0.197	0.063	0.055	0.131	0.057	0.447	0.060	0.060	
	14	0.047	0.023	0.018	0.032	0.025	0.081	0.030	0.024	
	11	0.043	0.021	0.015	0.070	0.043	0.120	0.028	0.014	
	12+13		0.004		0.009	0.005	0.028	0.007	0.005	
3Cl	30	0.045	0.026	0.019	0.030	0.026	0.096	0.033	0.024	
	18	0.041	0.014	0.009	0.041	0.021	0.133	0.021	0.012	
	17					0.016				
	24+27				0.004					
	16+32	0.013	0.005	0.004	0.017	0.008	0.054	0.010	0.007	
	23+34	0.000	0.014	0.011	0.019	0.019	0.058	0.021	0.014	
	29	0.012	0.006	0.005	0.008	0.008	0.027	0.010	0.007	
	26	0.016	0.007	0.005	0.014	0.010	0.062		0.013	
	25	0.011	0.005		0.008	0.007	0.031		0.011	
	28+31	0.170	0.076	0.057	0.125	0.110	0.475	0.089	0.005	
	20+21+33	0.013	0.006	0.004	0.014	0.009	0.044	0.008	0.019	
	22	0.030	0.013	0.009	0.033	0.019	0.116	0.015	0.017	
	39	0.075	0.041	0.027	0.043	0.047	0.131	0.055	0.010	
	38	0.019			0.012					
	35	0.013			0.008					
	37	0.213	0.087	0.074	0.138	0.121	0.482	0.126	0.044	
	4Cl	53	0.011	0.004	0.003		0.005	0.038	0.004	0.002
		51	0.019			0.038	0.007	0.000	0.005	0.003
		45			0.002			0.040	0.004	0.002
		69+52+73	0.024	0.013	0.007	0.016	0.013	0.098	0.008	0.005
43+49		0.027	0.001	0.008	0.020	0.015	0.110	0.010	0.006	
47+48+75		0.060	0.013	0.009	0.084	0.018	0.113	0.015	0.010	
44		0.007	0.003	0.002	0.005	0.004	0.029	0.002	0.001	
42+59		0.010	0.004	0.003	0.008	0.006	0.043	0.004	0.002	
71+41+64+72		0.025	0.012	0.008	0.017	0.015	0.086	0.012	0.007	
68		0.018			0.017	0.005		0.003		
40			0.003	0.002		0.003	0.025		0.002	
67+58						0.004				
63		0.071	0.043	0.032	0.047	0.051	0.147	0.055	0.044	
74+61+70		0.221	0.120	0.071	0.142	0.128	0.842	0.100	0.061	
66+76		0.109	0.059	0.031	0.073	0.060	0.437	0.050	0.031	
56+60		0.057	0.028	0.017	0.035	0.031	0.213	0.029	0.025	
79								0.004	0.016	
81			0.003	0.002		0.004		0.004	0.005	
77		0.029	0.011	0.007	0.014	0.014	0.067	0.011	0.007	

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(Continue Table 2)

	IUPAC No	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
5Cl	93+98+95+102	0.035	0.019	0.008	0.024	0.014	0.121	0.013	0.005
	88+91	0.009	0.005	0.003	0.007		0.028	0.003	0.002
	121					0.005			
	84+92	0.016	0.009	0.005	0.011	0.007	0.053	0.005	0.002
	90+101	0.044	0.028	0.014	0.030	0.018	0.148	0.016	0.008
	99+113	0.053	0.033	0.017	0.036	0.022	0.176	0.021	0.009
	86+7 종	0.020	0.013	0.006	0.011	0.010	0.079	0.005	0.004
	110+120	0.069	0.005	0.003	0.006	0.004	0.034	0.003	0.002
	82	0.174	0.111	0.060	0.116	0.080	0.616	0.065	0.029
	107+108			0.002		0.004		0.004	0.002
	106+118	0.044	0.026	0.014	0.029	0.019	0.180	0.015	0.006
	122			0.004		0.005		0.006	0.005
	105	0.025	0.016	0.008	0.015	0.012	0.106	0.008	0.004
	127	0.026	0.012	0.010	0.013	0.014	0.046	0.017	0.013
	6Cl	136	0.009	0.006	0.003	0.008	0.005	0.027	0.005
154								0.009	
151		0.019	0.009	0.006	0.011	0.007	0.051	0.007	0.003
135+144		0.013	0.005	0.004	0.008	0.006	0.025	0.005	
139+149		0.067	0.038	0.022	0.045	0.032	0.186	0.023	0.009
134+143									0.001
146+165		0.015	0.008	0.006	0.010	0.008	0.035	0.007	0.002
132+161		0.023	0.014	0.006	0.014	0.010	0.065	0.008	0.003
153		0.135	0.084	0.052	0.084	0.063	0.426	0.053	0.022
141		0.038	0.019	0.009	0.017	0.016	0.116	0.013	0.006
130+137		0.011		0.004	0.006	0.005			
163+138+164		0.054	0.033	0.020	0.033	0.025	0.168	0.020	0.009
158+160		0.007	0.004	0.002	0.004	0.004	0.025	0.004	
128+162		0.018	0.008	0.005	0.008	0.007	0.049	0.006	0.002
167		0.010	0.005						
156	0.013	0.010	0.005	0.007	0.006	0.053	0.007		
157	0.006								
8Cl	202	0.006	0.005	0.002	0.004	0.004	0.030	0.008	
	201	0.007				0.004	0.010		
	200		0.003				0.015		
	199	0.018	0.011	0.006	0.009	0.015	0.080	0.009	
	196+203	0.014	0.005	0.004	0.007	0.005	0.044	0.008	
	195	0.021	0.004	0.002	0.006		0.030		
	194	0.067	0.010	0.010	0.011	0.009	0.088	0.011	
9Cl	208					0.023			