

**THE CONCENTRATION DISTRIBUTION OF POLYCHLORINATED BIPHENYLS
IN THE OFF-GAS AND SOIL SAMPLES
AROUND INCINERATION FACILITIES AND SOURCE ESTIMATION**

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Introduction

As it is increasing in population and industrial activity is getting various and complex, a number of chemicals had been used in human life and some of them were prohibited in production and usage due to their toxicity and harmful effects to environment. PCBs are one of those compounds, which are of great concern worldwide, especially in international conventions such as Basel and Stockholm Convention.¹

Polychlorinated biphenyls (PCBs) are a group of chlorinated aromatic hydrocarbons once widely used in industry as heat transfer fluids, hydraulic lubricants, flame retardants, and as dielectric fluids in electronic components because of their acid-, alkali- and hydrolysis-resistance and thermal stability.²

Although PCBs are having been issued in the world from earlier, it is regarded that PCBs wastes are not well-managed and disposed completely in Korea. Furthermore, concentration distribution in environmental media as well as emission amounts is not grasped clearly.

Therefore, in this study, we determined the whole PCBs congeners in environmental media around industrial complex to investigate the concentration distribution and compare distribution patterns between environmental media.

Materials and Methods

8 soil samples were collected in Sihwa and Banwol industrial area using pre-cleaned core-sampler made of stainless steel. Sampling method was based on Analytical Methods of Endocrine Disrupting Chemicals (NIER, 2002).³ After pretreatment such as drying, sieving and etc, each sample was extracted by soxhlet extraction apparatus with distilled toluene for more than 20hr. And then extracts were treated with H₂SO₄, followed by multilayer silica gel column, alumina column and activated carbon column. Total 209 congeners of PCBs were analyzed with HRGC (HP6890)/HRMS (Finnigan MAT 95X). DB-5MS column was used and isotope dilution method was used in quantification.

Results and Discussion

Concentration in environmental media

Concentration of soil samples was ranged from 2.432~273.989 ng/g dw (0.116~60.509 pg WHO-TEQ/g dw). Ratio of coplanar PCBs to total PCBs was highest in soil-3 whose TEQ concentration was the highest. The analytical results are described in Table 1.

Table 1 Concentration of PCBs in soil samples

Sample Code	HS-1	HS-2	HS-8	HS-12	HS-14	HS-17	HS-20	HS-5
total PCBs	3.971	5.930	273.989	3.764	209.105	2.432	36.230	6.440
1~3CB	3.253	4.016	5.446	2.841	47.188	1.384	10.511	2.175
co-PCBs	0.080	0.270	91.340	0.118	34.663	0.194	6.563	1.087
co-PCBs/total PCBs	2%	5%	33%	3%	17%	8%	18%	17%
WHO-TEQ	0.141	0.439	60.509	0.116	18.702	0.188	6.856	0.964

¹⁾ Unit is ng/g dw; WHO-TEQ is pg WHO-TEQ/g dw.

³⁾ Total PCBs is sum of 1~10CB and 1~3CB was excluded in factor analysis.

Comparison of distribution patterns

Generally low-chlorinated PCBs (1~4CB) were dominant than high-chlorinated PCBs (5~10CB). Homologue distributions differed from sample to sample, but isomer distribution was very similar with each other.

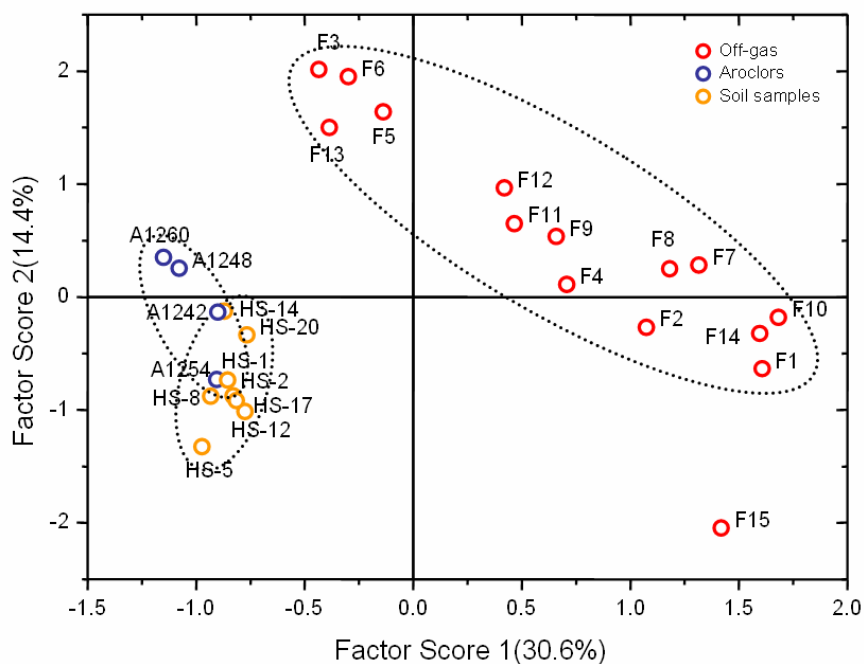


Fig. 1 Factor score plot of soil samples, off-gas and aroclors.

Formation, sources and source inventories

In factor analysis, 1~3CB were excluded due to their uncertainty from low recovery rate and factor analysis was carried out using SPSS 10.0. In the factor score plot, off-gas samples were spread out relatively. It may be because off-gas samples were collected from numerous kinds of incineration facilities. Especially, F15 sample showed unique distribution pattern than other 14 off-gas samples.

Aroclors and soil sample group were placed in a short distance. Actually, isomer distributions in each homologue of aroclors and soil samples were similar with each other to some extent, although there was a little bit of difference. It can be caused because the sampling site is industrial complex in which various electronic equipments were used. However, effect of incineration facilities shouldn't be negligible because there are many incineration activities in this area.

Additionally, it is considered that further investigation about sources of PCBs is necessary to make sure the relationship between environmental media and sources in this study area.

Acknowledgement

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References

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