

THE CONCENTRATION AND RELASHIONSHIP BETWEEN PCDD/Fs AND PM10 IN AMBIENT AIR OF KOREA

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Introduction

PCDD/Fs, the representative compounds of Persistent Organic Pollutants(POPs), are released ambient air from various sources such as incinerators, vehicles, residential heating. Furthermore, the PCDD/Fs levels in ambient air are influenced by various weather condition and other pollutants such as precipitation, temperature, wind speed and dust.¹

PCDD/Fs in ambient air consist of particulate matter including PM10 and gaseous phase. In this study, we investigated the relationship between PCDD/Fs and PM10 levels by sampling at 7 sites near Seoul city for continuous 5 days. It was also evaluated the particulate and gaseous phase distribution of PCDD/Fs.

Materials and Methods

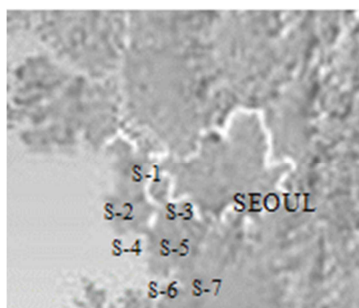
PCDD/Fs in ambient air was sampled at 7 sites of commercial, residential and industrial area in Incheon and Gyeonggi-do, the west region of Seoul.

PCDD/Fs were collected 5 samples with flowrate of 350~450Nm³/day at each site for continuous 5 days, using a high volume air sampler with quartz filter for particulate phase, polyurethane foam(PUF) plug and XAD-2 resin for gaseous phase.

For PCDD/Fs analysis, it was carried out in a manner of Korean official method for the examination of air pollutants. The analysis was performed on selected ion monitoring mode with a JEOL JMS-700 high resolution mass spectrometer connected with high resolution gas chromatograph.

PM10 data were quoted from national air pollutants monitoring station, collected at each site continuously for one data per hour with β -Ray method.

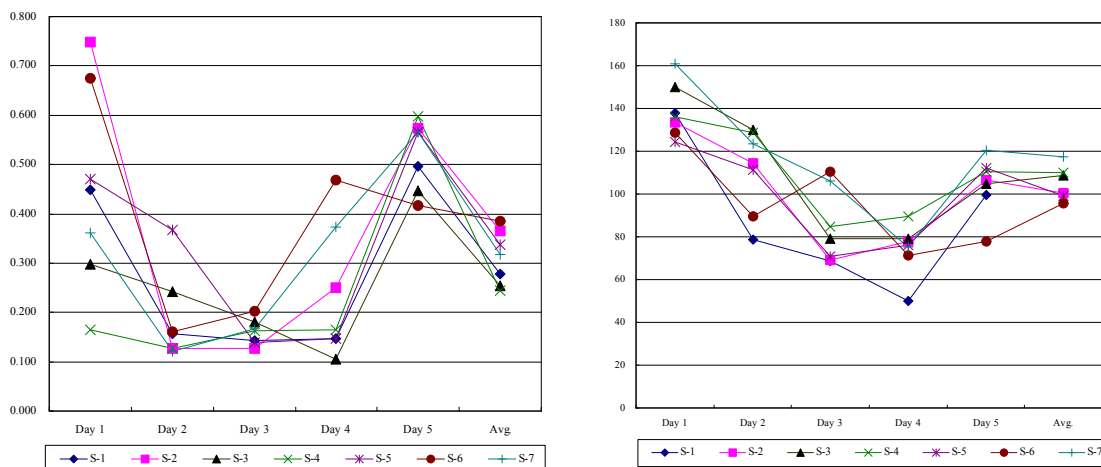
Result and Discussion



The average PCDD/Fs concentration in ambient air was 0.312 pg-TEQ/Nm³(0.121~0.749, n=35) and PM10 was 103 μ g/Nm³(50~161, n=35). There was wide gap in PCDD/Fs levels in spite of the same sampling site and continuous sampling, because of the difference of wind speed and wind direction. Table 1 shows PCDD/Fs and PM10 concentrations in ambient air for 5 days at each site.

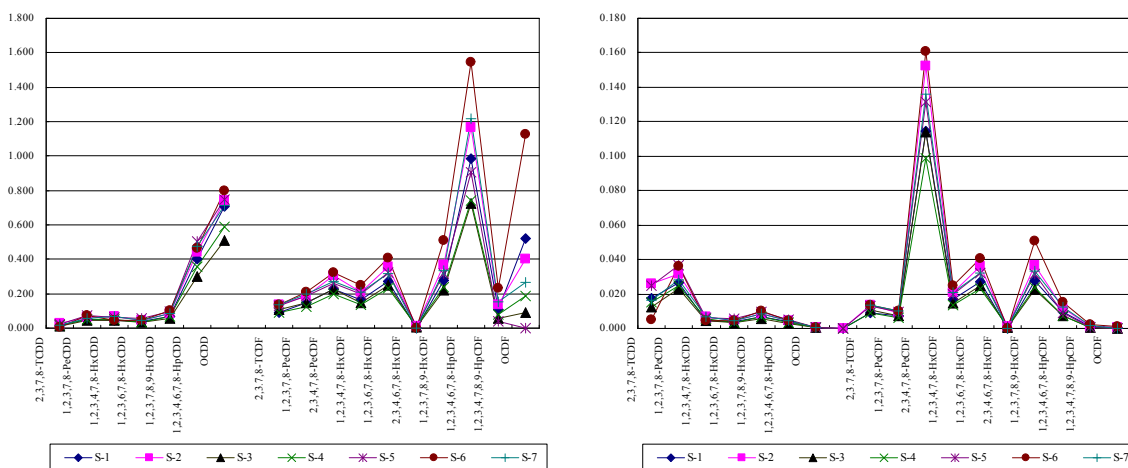
Table 1. PCDD/Fs and PM10 concentrations in ambient air(n=5 at each site).

Items	S-1	S-2	S-3	S-4	S-5	S-6	S-7
PCDD/Fs (pg/Nm ³)	0.278 (0.143~0.497)	0.365 (0.127~0.749)	0.255 (0.106~0.446)	0.243 (0.127~0.598)	0.337 (0.138~0.565)	0.385 (0.161~0.675)	0.318 (0.121~0.566)
PM10 (μ g/Nm ³)	87 (50~138)	100 (69~134)	109 (79~150)	110 (85~136)	99 (71~125)	96 (71~129)	117 (75~161)



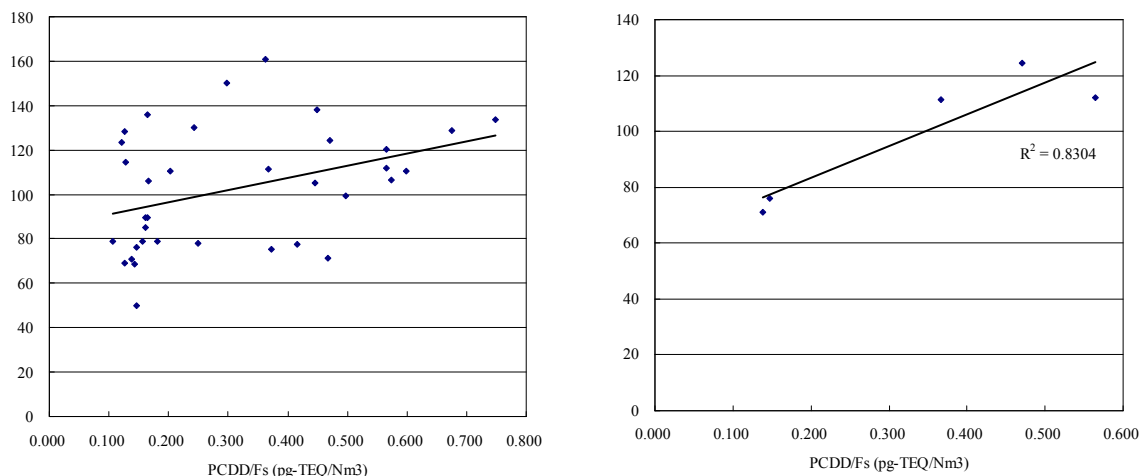
(a) PCDD/Fs (b) PM10
 Fig. 1. PCDD/Fs and PM10 concentrations in ambient air

Fig. 2 shows the isomer pattern of ambient samples. In this study, high chlorinated isomers such as 1,2,3,4,6,7,8-HpCDF, OCDD and OCDF in 17 toxic PCDD/Fs is notable. As the TEQ value, 2,3,4,7,8-PeCDF which TEF is 0.5 was the majority of PCDD/Fs in whole experiments, and 1,2,3,7,8-PeCDD and 1,2,3,6,7,8/1,2,3,7,8,9-HxCDF were also predominant isomers.



(a) Total concentration (b) TEQ concentration
 Fig.2. Isomer pattern of PCDD/Fs during PVC Combustion

Fig. 3 shows the relationship PCDD/Fs and PM10 in ambient air. There wasn't a significant relationship between PCDD/Fs and PM10 level for whole samples, but it was founded at some sites. It was assumed that there was a lot of sources like vehicles, residential heating, incinerators, etc. Fig. 3(b) was the graph of the relationship at S-4, which site is located in the center of industrial area, less influenced by other sources.



(a) Whole samples (b) S-4 samples

Fig. 3. Relationship between PCDD/Fs and PM10 levels.

PCDD/Fs in ambient air consist of particulate and gaseous phase. For investigating the phase distribution, it was analyzed separately for samples of S-6 and S-7 sites. The particulate phase of PCDD/Fs was collected at quartz filter and the gaseous phase at absorbents such as PUF and XAD-2 resin. In this study, the particulate phase was more predominant than gaseous phase in PCDD/Fs level for whole samples. This result was similar to the result of Kim et al(2005).²

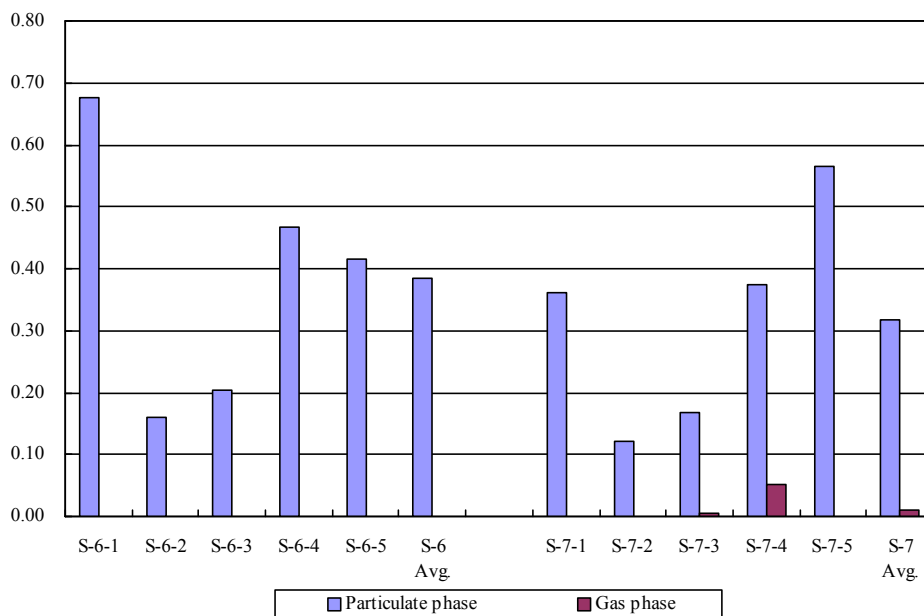


Fig. 4. Phase distribution of particulate and gaseous phase in PCDD/Fs level.

References

1. YongSuk C, JeungHoon E, JoongSup Y, MinYoung K, SeungGu A. *Organohalogen Comp*2005;1216.
2. DongGi K, YoonKi M, YongKi L, YeonHoon J, GuHwan K, JouYeal K, JongChan K, ChinSuk S, DongHoon L. *Organohalogen Comp*2005;1189.