

Formation and Concentration Level of PCDDs/DFs by Fire Accident in Korea

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Introduction

Pollutants generated by fire accident undergo incomplete combustion process unlike a form of general incinerator. And these compounds are diffused into the environment as a form of vapor and particulate phase without a special treatment process. Therefore, fires can indicate one of source for PCDDs/DFs and related compounds.¹ This study was performed to grasp concentration level of PCDDs/DFs in combustion products generated from fire accidents of 3 times recently occurred in Korea-LPG explosion accident at Bucheon, clothes stores of Dongdaemun market, and shoes factory of Pusan city.

Experimental Methods

Sampling and fire accident

Fire products were collected in accidental sites. Fig. 1 shows sampling point of fire accidents. Information related to fire accidents was summarized in Table 1.

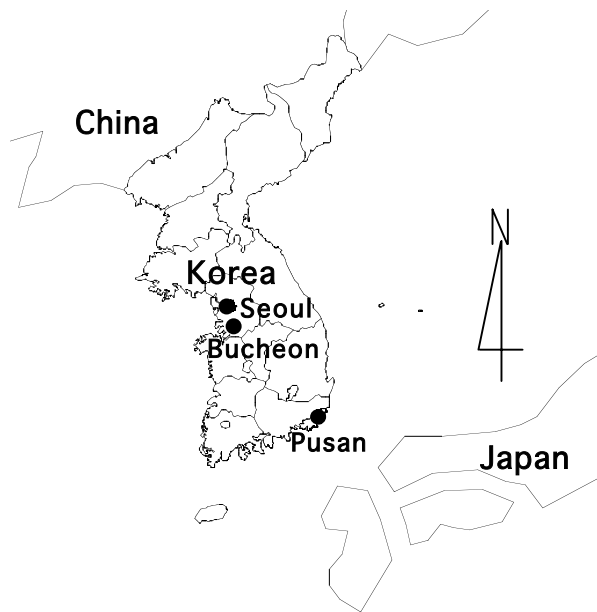


Fig. 1. Map showing accidental points(●).

Table 1. Information related to fire accident.

	Bucheon (LPG station)	Seoul (Dongdaemun market)	Pusan (Shoes factory)
Date	11 September 1998	12 November 1998	4 January 1999
Accident cause	Under investigation about leakage of gas pipe	Under investigation about an electric leakage	Under investigation about an ignition of spray used shoes luster
A life damage	81 injured persons (a civilian 57, a fire fighter 24)	4 persons (death 1, an injury 3)	None
A fortune damage	2,288,000,000 won (about 2,000,000 dollars)	1,120,000,000 won (about 1,000,000 dollars)	220,000,000 won (about 200,000 dollars)

Analytical procedure

After sample dried at a room temperature, extracted with 200ml of toluene for 6 hours under reflux and then filtered. After addition of keeping solvent(n-Nonane 0.5ml), the extract was transferred to n-Hexane and then adjusted to a volume of 10ml. After spiking of internal standards(EDF-8999, CIL Inc.), purified using multi-layer silica gel chromatography and alumina column(Neutral, Activate I, Merck) chromatography and analyzed with HRGC(HP5970)/HRMS(JMS 700, Jeol). Analytical methods and conditions were similar with several papers described previously.²⁻³

Results and Discussion

Concentration levels

Mean total and I-TEQ concentration of PCDDs/DFs for each accidental point was illustrated in Fig. 2. Total concentration of PCDDs/DFs analyzed at Bucheon 8 sites was 1.89-3.79ng/g, was 15.5-1504pg/g for I-TEQ concentration. PCDDs/DFs in 6 samples of Dongdaemun market at Seoul city had concentration range of 1.8-30.35ng/g, and 2.74-52.74 for I-TEQ concentration. Sample of fire accident occurred at Yongho-dong of Pusan city showed a low concentration level as compared with other sites. From these results, we conclude that promotion of active chlorine reaction causing LPG of combustible material used as a car fuel contributed to the high PCDDs/DFs concentration. Therefore, these will need to treat as a special management object alike a fly ash of incinerator rather than a form of general reclamation because combustion products generated at fire accident contain PCDDs/DFs of high concentration.

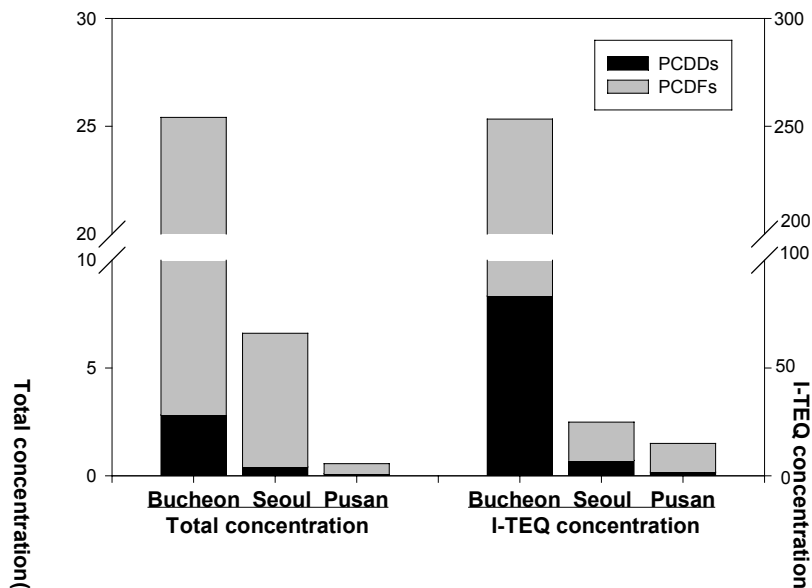


Fig. 1. Concentration levels of PCDDs/DFs for each site.

Congener profile

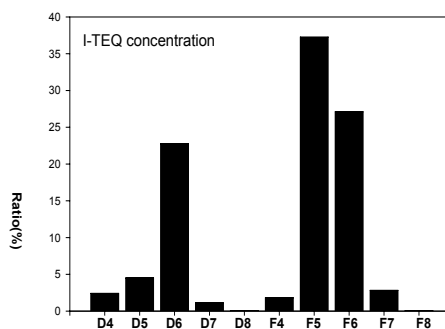
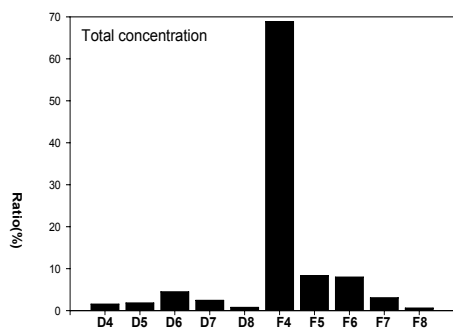
Average congener profile at each site was illustrated in Fig. 2. TCDF was the predominant congener for total concentration at all three sites, Dongdaemun market site of Seoul occupied 87% especially. Congener profile represented at three sites unlikely.

References

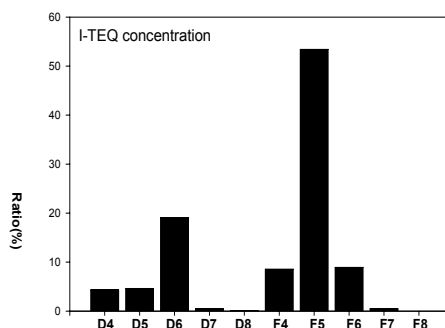
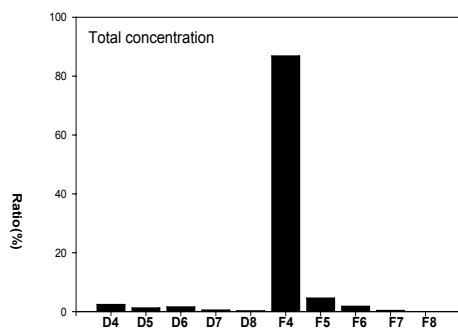
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Bucheon



Seoul



Pusan

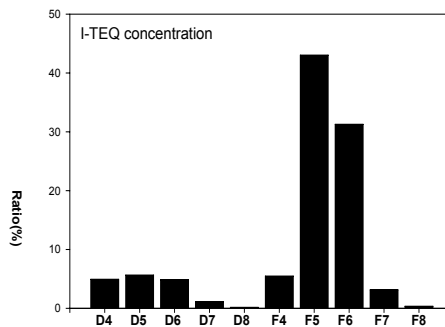
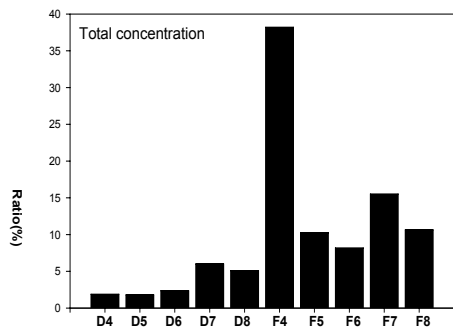


Fig. 2. Average congener profile for each site.