Dioxins Transfer from Fluegas to Residues in Combustion Gas Treatment Facility of industrial waste incinerators

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Introduction

Dioxin emission from incineration plant, prepared for Stockholm convention on persistent organic pollutants selected by UNEP, was continuously investigated in Korea since 2001. Furthermore, the concern of PCDD/Fs emission from incineration plant was enlarged from fluegas to residues such as bottom ash, flyash and wastewater. Thus, it is essential to investigate PCDD/Fs transfer from fluegas to residues for control of total emission.[1,2]

In this study, we investigated the relationship of PCDD/Fs concentration between fluegas and residues at large scale industrial waste incinerators.

Materials and Methods

We investigated PCDD/Fs in the fluegas and residue(bottom ash, flyash and wastewater) from 12 industrial waste incinerators(Stoker=8, Rotary Kiln=2, Fludized bed combustor=2), which capacity was over 2.0 ton/hr. Fluegas sampling was conducted at inlet and/or outlet of combustion gas treatment facility such as waste heat boiler(WHB), electrostatic precipitator(EP), bag filter(BF) etc. Bottom ash was sampled at the lower part of incinerator, flyash at the bottom of cooling part and dust collector, and wastewater at cooling tower(CT), wet scrubber(WS) and wet EP.

For PCDD/Fs sampling and 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.

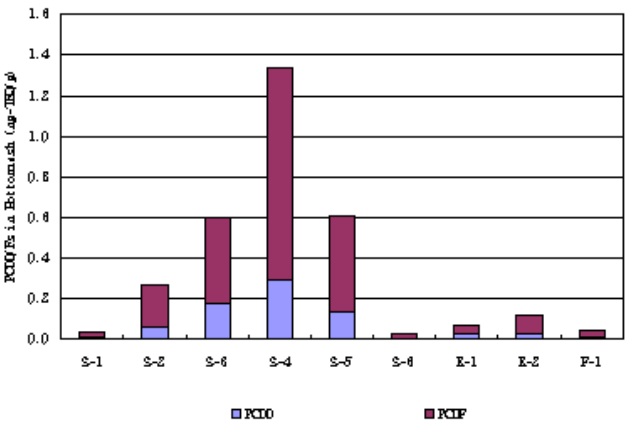
Result and Discussion

The average PCDD/Fs concentration was 0.344 ng-TEQ/g(0.021~1.340) in bottom ash, 7.285 ng-TEQ/g (0.029~28.885) in flyash, and 9.269 ng-TEQ/L(0.023~56.112) in wastewater (Table 1).

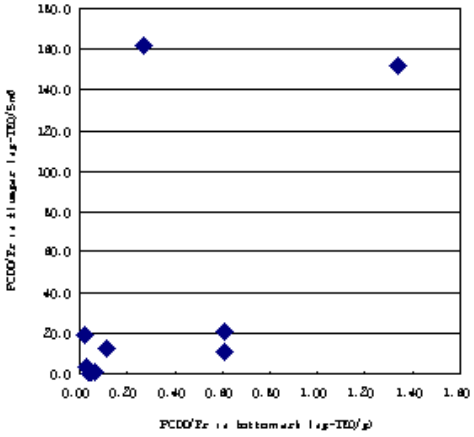
Table 1. PCDD/Fs concentration in residues from industrial waste incinerators.

Items	Bottom ash (ng-TEQ/g)	Flyash (ng-TEQ/g)					Wastewater (ng-TEQ/L)		
		WHB	CY+BF	CY	BF	EP	Cooling water for bottom ash	CT	WS/ Wet EP
No.	9	1	2	3	5	1	2	1	5
Residues	0.344 (0.021~1.340)	6.794	14.509 (0.133~28.885)	0.224 (0.122~0.288)	10.163 (0.029~27.937)	0.115	0.067 (0.023~0.110)	0.341	14.736 (0.095~56.112)
		7.285(0.029~28.885)					9.269(0.023~56.112)		

PCDD/Fs concentrations in bottom ash were 0.479 ng-TEQ/g(0.021~1.340, n=6) at stoker type incinerators, 0.094 ng-TEQ/g(0.069~0.118, n=2) at RK, and 0.040 ng-TEQ/g (n=1) at FBC (Stoker>RK>FBC) due to combustion temperature and waste composition (Fig. 1(a)). Fig. 1(b) shows the nearly positive correlation of PCDD/Fs concentrations between bottom ash and fluegas at cooling section outlet of incinerators.



(a)

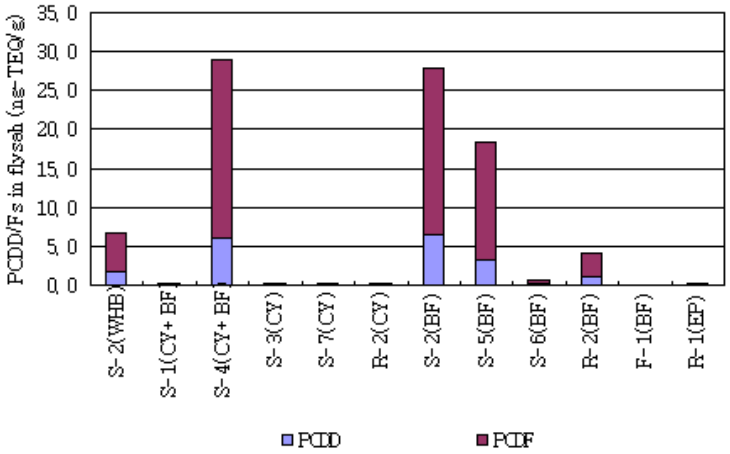


(b)

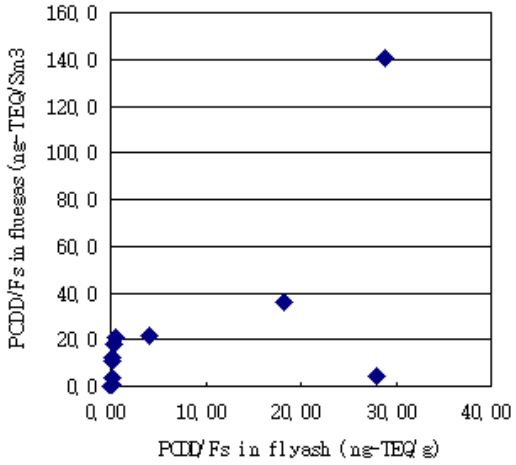
Fig. 1. (a) PCDD/Fs concentration in bottom ash (S:Stoker, R:Rotary kiln, F:Fluidized bed combustor), (b) Correlation of PCDD/Fs concentration between bottom ash and fluegas at cooling section outlet of incinerator.

Among the incinerators investigated in this study, the dust collection was conducted with BF at 5 incinerators, multi cyclone(CY) at 2 incinerators, CY+BF at 3 incinerators, and EP at 1 incinerator.

As Fig. 2(a) was shown, the PCDD/Fs concentration in flyash from BF was higher than CY or EP for the most part. The more PCDD/Fs concentrations in fluegas detected, the higher PCDD/Fs was analyzed in flyash.



(a)

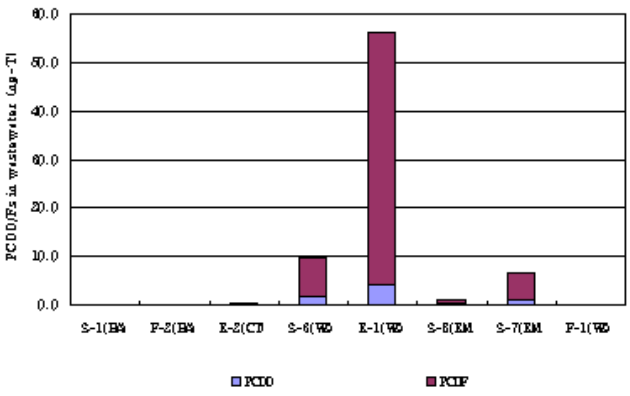


(b)

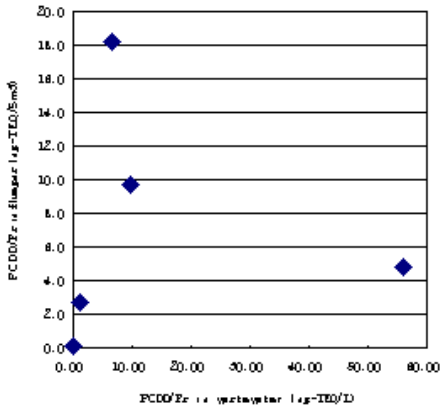
Fig. 2. (a) PCDD/Fs concentration in flyash (S:Stoker, R:Rotary kiln, F:Fluidized bed combustor), (b) Correlation of PCDD/Fs concentration between flyash and fluegas at dust collector inlet.

It was analyzed eight samples of wastewater from Industrial waste incinerator. Two samples were cooling water of hot bottom ash and one was cooling water of hot fluegas from cooling tower, and five samples were rinsing water of scrubbing section such as water wet scrubber, wet EP, rotary membrane scrubber(RM).

The PCDD/Fs concentrations of cooling water of bottom ash and cooling tower were lower than those of rinsing water of fluegas. Among rinsing water samples, there were wastewater treatment facilities in incineration plant except R-1. Therefore R-1 had relatively slower exchange interval than other incinerators, it was assumed that it leads to memory effect of PCDD/Fs.



(a)



(b)

Fig. 3. (a) PCDD/Fs concentration in flyash (S:Stoker, R:Rotary kiln, F:Fluidized bed combustor, BA:Cooling water of bottom ash, CT:cooling tower, WS:wet scrubber, RM:rotary membrane scrubber), (b) Correlation of PCDD/Fs concentration between wastewater and fluegas at scrubbing section inlet.

References

1. M. Guigliano, S. Cernuschi, M. Grosso, W. Tirler, M. Donega, S. Raccanelil, M. Favotto, E. Aloigi and R. Miglio (1999), *Organohalogen Compounds* 40: 473-476.

2. M. Guigliano, S. Cernuschi, M. Grosso, R. Miglio and E. Aloigi (2000), *Organohalogen Compounds* 46: 146-149.