COMPARISON OF PCDD/PCDFS COMPOSITION IN GAS AND SOLID PHASE EMITTED FROM SINTER PLANTS OF POSCO IN KOREA

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Introduction

Recently sinter plants are watched as main emission source of dioxins. Dioxins of sinter plants are formed by several sources (raw material containing dioxins, condensation of precursors and de novo synthesis). In sinter plants, required conditions occurring de novo synthesis are satisfied. For example, carbon with defective structure, inorganic chloride, copper as catalyst and temperature (250-400°C). Therefore dioxins formation in sinter plants may be mainly occurred by de novo synthesis. But definite mechanism has not been verified in sintering process.
Also raw materials used in sinter plants and operating conditions are different in each country. Therefore this study is focused to investigate distribution of dioxins containing in gas and solid phase emitted from sinter plants of POSCO in Korea.

Experimental

Two of eight sinter plants in POSCO are selected for this study. The volume flow rates of these plants are about 1,000,000 – 1,500,00Nm^3/min. Also concentration of O_2, CO_2 and CO is about 15%, 5% and 10,000ppm. Samples were collected by isokinetic method and analysis of dioxins was accomplished according to US EPA Method 1613.

Results and Discussion

Amounts of dioxins in gas and solid phase are shown at Table 1. These values are contrary to results of sinter plants of west countries. According to report of British Steels amount of dioxins in gas and solid phase was about 6 : 4.

Table 1. The percent of dioxins(TEQ value) in gas and solid phase emitted from two sinter plants.

Phase	plant 1	plant 2
Gas	40.91611	31.14171
Solid	59.08389	68.85829

Table 2. The percent of congeners in gas and solid phase emitted from sinter plant No. 1.

Congener	plant1		
	gas	solid	total
2,3,7,8-TCDF	3.462651	1.163458	4.626109
1,2,3,7,8-PeCDF	1.267427	1.104048	2.371475
2,3,4,7,8-PeCDF	22.9434	26.82886	49.77226
1,2,3,4,7,8-HxCDF	1.217918	3.490375	4.708294
1,2,3,6,7,8-HxCDF	2.298202	6.512397	8.810599
2,3,4,6,7,8-HxCDF	1.891239	8.468988	10.36023
1,2,3,7,8,9-HxCDF	0.096047	1.202075	1.298123
1,2,3,4,6,7,8-HpCDF	0.407953	2.104127	2.51208
1,2,3,4,7,8,9-HPCDF	0.051489	0.287151	0.338641
OCDF	0.015843	0.039607	0.05545
2,3,7,8-TCDD	1.927875	0.427757	2.355632
1,2,3,7,8-PeCDD	3.222037	2.67942	5.901458
1,2,3,4,7,8-HxCDD	0.431717	0.973344	1.405062
1,2,3,6,7,8-HxCDD	0.841651	1.694194	2.535844
1,2,3,7,8,9-HxCDD	0.482216	1.298123	1.780339
1,2,3,4,6,7,8-HpCDD	0.322798	0.744613	1.067411
OCDD	0.035646	0.065352	0.100998

Table 2 and 3 show percentage of each congener to total amount in gas and solid phase. As shown table 2 and 3, 2,3,4,7,8-PeCDF was about a half of total amount. This result was almost same with incinerator. But amounts of PCDDs were less than incinerator. Therefore mechanism of PCDDs and PCDFs formation in sinter plants has a little difference with incinerator.

Figure 1 shows ratios of gas to solid in each congener. The ratio of gas to solid in total amount were 0.69 and 0.45 in plant 1 and 2. As shown Figure TCDD, TCDF, PeCDD and PeCDF were more than total ratio. And ratios of hexachlorinated compounds were less than total ratio.

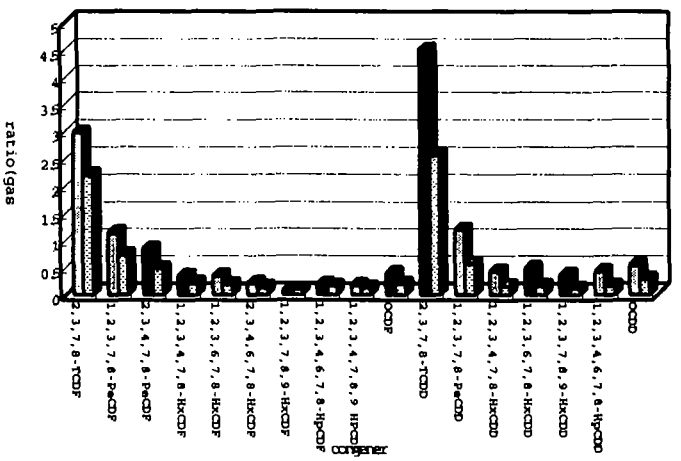
Therefore tetra- and penta- chlorinated compounds are contained relatively more amount in gas phase and hexa-, hepta- and octa- chlorinated compounds are contained relatively more amount in solid phase.

This study is planning to investigate concentrations of congeners in each particle size using cascade impactor.

Table 3. The percent of congeners in gas and solid phase emitted from sinter plant No. 2.

Congener	plant2		
	Gas	solid	total
2,3,7,8-TCDF	3.578921	1.628362	5.207283
1,2,3,7,8-PeCDF	1.033807	1.390772	2.42458
2,3,4,7,8-PeCDF	18.02557	36.96441	54.98997
1,2,3,4,7,8-HxCDF	0.635119	2.914827	3.549946
1,2,3,6,7,8-HxCDF	1.26908	6.589942	7.859022
2,3,4,6,7,8-HxCDF	0.99672	7.014128	8.010848
1,2,3,7,8,9-HxCDF	0.085764	0.855325	0.941089
1,2,3,4,6,7,8-HpCDF	0.222524	1.382659	1.605183
1,2,3,4,7,8,9-HPCDF	0.027815	0.209775	0.23759
OCDF	0.009272	0.044041	0.053313
2,3,7,8-TCDD	2.108179	0.820556	2.928735
1,2,3,7,8-PeCDD	2.385174	4.120163	6.505337
1,2,3,4,7,8-HxCDD	0.154144	0.923705	1.077848
1,2,3,6,7,8-HxCDD	0.315242	1.915789	2.23103
1,2,3,7,8,9-HxCDD	0.162257	1.313121	1.475378
1,2,3,4,6,7,8-HpCDD	0.11358	0.706976	0.820556
OCDD	0.018544	0.063744	0.082287

Figure 1 Ratios of gas to solid in each congener.



Reference

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