DISTRIBUTION CHARACTERISTICS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SEDIMENTS FROM THE SOUTHEASTERN COASTAL AREAS OF KOREA

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Introduction

Polycyclic aromatic hydrocarbons(PAHs) are widespread environmental contaminants resulting from combustion process, discharge of fossil fuels and automobile exhausts.[1-2] Because of their mutagenic and carcinogenic properties, PAHs have been measured in a variety of environmental matrices including air, water, soil and marine sediment. [3-4] Thus, these compounds have harmful damaging effects on human and ecosystem. In particular, sediment is known as a deposition place of persistent organic pollutants(POPs).[5-6] The aim of this work is to assess the contamination level and contamination source characteristics of PAHs in sediments from the southeastern coastal areas of Korea.

Experimental methods

Sampling sites

Sampling sites of sediments are illustrated in Fig. 1. Samples were collected in Pohang, Pusan, Ulsan and Chinhae Bay of Korea in February, 2000.

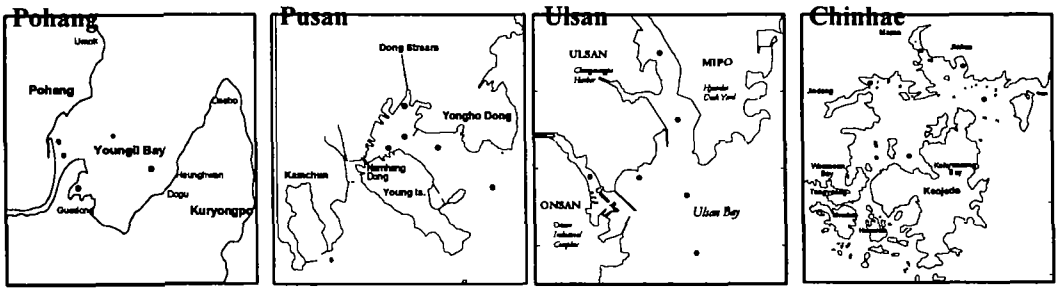

Fig. 1. Map showing sampling sites.

Analytical procedure

Samples were freeze-dried and sieved to <2 mm. Analytical methods were based on previously used methods.[7] 20g of sediments were extracted in a soxhlet apparatus with 200 ml of toluene for 16 horus, then the volume was reduced to 1-2ml in a rotary evaporator. The extract was transferred to n-hexane and internal standard(ES-2044, CIL) was spiked. The n-hexane layer was concentrated and subjected to silicagel column clean up. Quantification of PAHs were performed by GC(GC17A) /MS(ShimadzuQP5050A).

Results and discussion

Concentration

Table 1 shows the concentration of 16 PAHs(EPA 610) in sediments from southeastern coastal areas of Korea.

Table 1. Concentration of 16 PAHs in sediments from southeastern coastal areasof Korea (ng/g dry wt)

Compounds	Abbreviation	Pohang	Pusan	Ulsan	Chinhae
Naphthalene	NaP	0.6~32.9	1.9~12.1	0.6~1.9	0.6~3.7
Acenapthylene	AcPy	0.6~4.17	0.7~2.4	0.5~0.6	0.5~0.8
Acenapthene	AcP	4.5~36.1	0.9~6.7	0.4~2.7	0.4~1.2
Fluorene	Flu	3.2~57.5	1.4~7.7	0.4~2.6	0.5~5.4
Phananthrene	PhA	11.5~281.3	12.3~46.3	3.0~21.9	2.6~45.0
Anthracene	AnT	2.6~44.5	2.9~18.6	0.5~3.0	0.6~54.3
Fluoranthene	FluA	14.5~246.4	16.4~71.8	4.4~41.0	5.1~28.3
Pyrene	Pyr	15.1~232.8	15.0~81.4	3.8~36.9	5.7~35.3
Benzo(a)anthracene	BaA	7.3~167.4	7.0~34.6	2.3~17.0	2.7~13.5
Chrysene	Chr	9.9~207.8	11.1~45.4	3.8~24.6	4.1~18.5
Benzo(b)fluoranthene	BbF	19.8~253.6	14.9~67.4	5.9~33.1	6.5~15.2
Benzo(k)fluoranthene	BkF	9.1~147.0	9.4~33.5	2.4~18.0	4.3~11.0
Benzo(a)pyrene	**BaP**	**4.6~225.0**	**3.2~35.3**	**0.8~5.3**	**1.5~4.9**
Indene(1,2,3-c,d)pyrene	InP	14.4~202.1	11.0~44.0	3.5~18.2	5.9~14.1
Dibenzo(a)anthracene	DbA	2.8~41.9	2.7~9.2	1.4~4.1	1.5~3.0
Benzo(g,h,I)perylene	BghiP	16.4~232.7	12.0~52.5	3.7~19.1	5.8~14.9
16 PAHs		**149.5~2413.3**	**134.1~569.0**	**37.9~249.0**	**49.4~251.6**

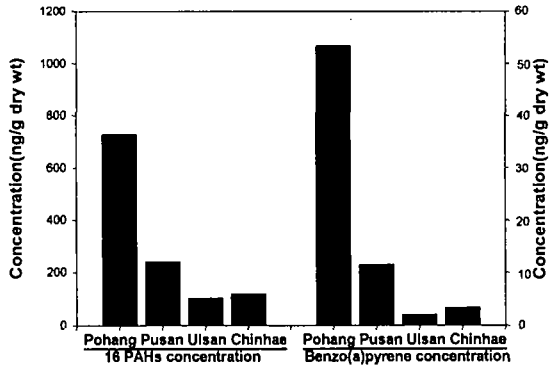

Fig. 2. Concentration of 16 PAHs and benzo(a)pyrene in sediments from southeastern coastal areas of Korea.

Fig. 2 shows average concentrations of total PAHs and benzo(a)pyrene in sediments from southeastern coastal areas of Korea, which was regarded as endocrine disruptors. The highest values were measured in the sediments of Pohang coastal areas. This could be result of continuous deposition of PAHs derived from stationary sources including urban run-off and river input. The Pusan coastal areas followed, and Chinhae and Ulsan Bay showed low levels of PAHs.

Profiles of PAHs

Profiles of 16 PAHs in coastal sediments are summarized in Fig. 3. The high molecular-weight compounds of FluA, Pyr, BbF, Chr, InP and BghiP were the predominant compounds in the sediments of those areas. In particular, Pohang coastal areas showed a high occupation ratio of BaP, InP and BghiP compared with other sites. This indicates that combustion process of high temperature in this area contributed to PAHs concentration. Pusan, Ulsan and Chinhae site was similar to congener profile of PAHs in atmosphere reported. This finding suggests that the contamintation of PAHs in marine environment be due to the atmospheric deposition of pollutants generated from various sources.

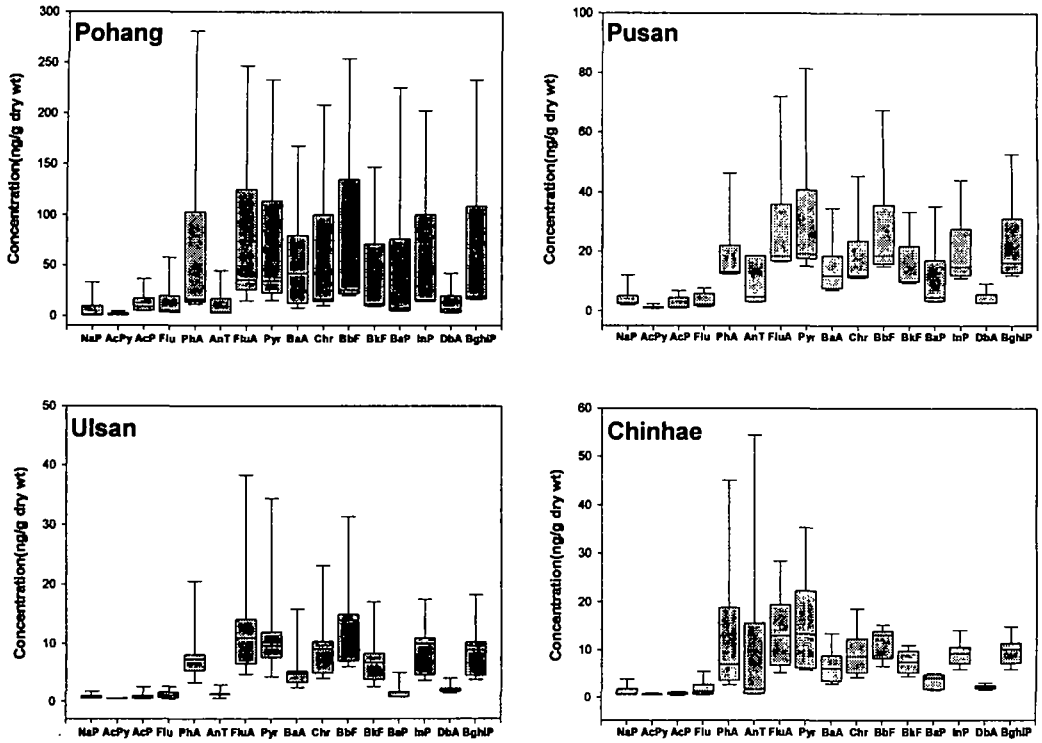

Fig. 3. Congeners profiles of 16 PAHs in sediments from southeastern coastal areas of Korea.

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