4A3) Ambient Concentrations and Source Apportionment of Particulate PAHs at Seoul between 2002 and 2003

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1. INTRODUCTION

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous organic pollutants mainly formed during incomplete combustion processes of fossil fuels. PAHs are associated with black carbon (BC) or soot particles.

The chemical mass balance (CMB) model is a class of receptor model. On the basis of the law of mass conservation, the CMB model calculation seeks to find the best-fit linear combination of the chemical compositions of the effluents from specific emission sources that is needed to reconstruct the chemical composition of chosen atmospheric samples (US EPA, 2004).

The objective of this study is to apportion the major sources of PAH at Seoul by applying the CMB model for the measurement data for two years.

2. EXPERIMENT

Sampling was carried out for 24 h at every sixth day with no rain from August 2002 to December 2003. The sampling procedures used in this study were followed to the methods of TO-13A (US EPA, 1999).

The samples were extracted by ultrasonication method and then analyzed by a GC/MSD/SIM for the analysis of 17 PAH compounds. The analytical procedures used in this study were described in detail in Lee et al. (2006).

3. CMB MODELING APPROACH

The CMB 8.2 program (US EPA, 2004) was used to estimate the source contribution of the ambient concentrations for the particulate PAHs. Based on the fuel consumption patterns at Seoul and the countries in Northeast Asia, seven major PAHs source profiles were chosen by type of fossil fuel; petroleum for (1) gasoline and (2) diesel vehicles, coal for (3) residential heating, (4) coke oven emission, and (5) power plant, NG for (6) residential heating, and (7) biomass burning.

The ambient measurement data of particulate PAHs from August 2002 to December 2003 were used for the source apportionment study. In this study, to correct the loss of PAHs concentrations due to photodegradation and/or ozonolysis of the PAHs, the concentrations of individual PAHs compounds were normalized to that of BeP since photodegradation and ozonolysis of BeP would not be large compared to other compounds.

4. RESULT

4.1 Ambient particulate PAHs concentration at Seoul

The average concentration of ambient particulate PAHs for the sampling period was 26.6 ± 28.4 ng $m^{-3}$and the level of particulate PAHs concentration at Seoul was low among the major cities in Asia, but, high or/and similar compared with those Europe and America.

The particulate concentrations of individual PAH compounds in winter were highest in all season and followed by fall and spring. The temporal variations between lower and higher MW PAHs were

different indicating the influence of gas-to-particle partitioning in winter season. The higher concentrations of higher MW PAHs in winter mean that the increase of the fossil fuel usage is important factor for the high concentrations of particulate PAHs in winter season.

4.2 Source apportionment of particulate PAHs

The major source of particulate PAHs at Seoul on an annual basis was gasoline and diesel vehicles accounting for 31% of total particulate PAHs. The seasonal variation for source contributions of PAHs was large as shown in Fig. 1. Coal emission (residential and coke oven) and biomass burning became important in fall and winter, which accounted for 63% of PAHs in fall and 82% of PAHs in winter, respectively. It might be transported from the outside of Korea, especially from China.

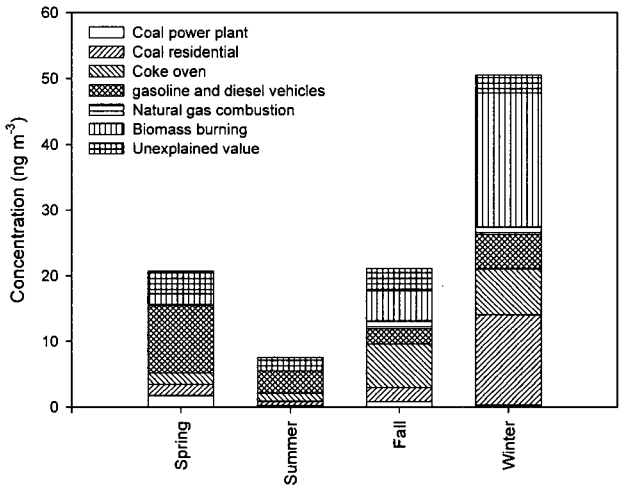

Fig. 1. Seasonal source contributions to particulate PAHs.

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