Seasonal variation of organic compounds in the ambient aerosols over Seoul, South Korea

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Atmospheric aerosols have been studied due to their impacts on atmospheric and global environment. Organic aerosols exist as a complex mixture of organic compounds in the atmosphere. These organic aerosols are originated from anthropogenic, natural biogenic, and geologic sources and they potentially alter their physical and chemical properties in the atmosphere, depending on the atmospheric and meterological condition (Rogge et al., 1993; Simoneit et al., 1991). Seoul is the capital of South Korea, with an area of 605 km^2, a total population has been over 10 million and the number of vehicles reached to almost 3 million in 2010, thus a large amounts of air pollutants are emitted (SI, 2010).

In this study, 76 organic compounds in the atmospheric particulate matter with an aerodynamic diameter of less than or equal to a nominal 10 μm (PM_{10}) over Seoul were identified and quantified for the samples collected from April 2010 to April 2011 by using a gas chromatography/mass spectrometry (GC/MS). The individual organic compounds were classified into the five groups, alkanes, polycyclic aromatic hydrocarbons (PAHs), fatty acids, dicarboxylic acids (DCAs) and sugars. The daily average concentration of the total quantified organic compounds was 1.99±1.29 μg/m^3 with the range from 0.43 to 8.70 μg/m^3. The seasonal average concentration was the highest in winter (2.77μg/m^3) and then decreased through fall (2.55 μg/m^3), summer (1.67 μg/m^3) and reached to the minimum level of 1.41 μg/m^3 in spring as shown in Table 1.

Table 1. The seasonal average concentrations of the organic groups (Average±STD) (unit: ng/m^3).

	Alkanes	PAHs	Fatty acids	DCAs	Sugars	Total
Spring	37.91± 13.14	8.41± 4.66	281.26± 114.58	408.16± 354.02	670.19± 528.52	1,405.83± 682.73
Summer	44.81± 28.77	2.33± 1.30	456.58± 117.14	696.78± 354.02	465.16± 242.89	1,665.67± 632.97
Fall	70.20± 36.67	14.98±1 3.87	661.76± 249.68	996.32± 1,350.89	807.53± 255.23	2,550.79± 1,642.27
Winter	99.75± 42.85	27.73± 8.86	830.13± 365.81	996.53± 993.71	812.25± 186.76	2,766.39± 1,399.84
Annual	56.93± 36.10	11.62± 11.58	502.70± 286.71	723.80± 906.06	692.05± 393.49	1,987.10± 1,293.24

All the organic groups showed higher seasonal average concentration from fall to winter than spring to summer due to their source strength. However, some organic compounds included in fatty acids, DCAs and sugars showed reverse pattern because of other influences such as secondary photochemical reaction and long range transport. Through these distinctive seasonal concentration patterns and relevant diagnostic parameters of the each individual organic compounds, their specific emission sources were clarified for more effective management of air quality in Seoul.

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