Characteristics and sources of polycyclic aromatic hydrocarbons in impervious surface run-off in an urban area in Shanghai, China

中国上海城市不透水面径流中多环芳烃的特性和根源研究

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The objectives of this paper

- Measure PAH concentrations in impervious surface run-off in the Shanghai urban area;
- Compare the PAH compositions of different surface run-offs;
- Determine the primary PAH sources and their relative contributions in the study area.

Sampling site

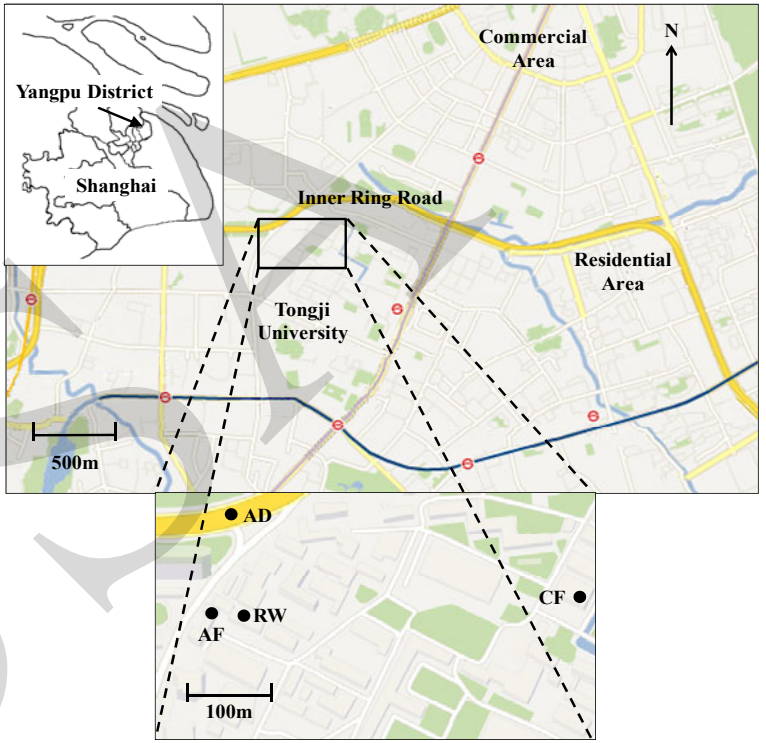

Fig. 1 Sample location map

Table 1 Characteristics of the sampling sites

Description	Sampling site	Location	Catchment area (m^2)
Ceramic tile roof (CF)	Haiyang building	Tongji University	120
Asphalt roof (AF)	Engineering center	Tongji University	85
Asphalt road (AD)	Inner ring road	North Zhongshan 2nd road	300
Rainwater (RW)	Shengtai building	Tongji University	–

PAH concentrations

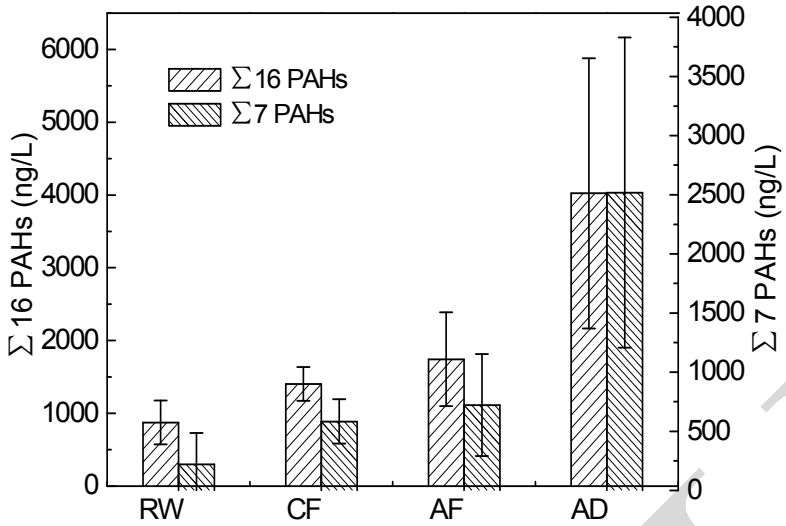

Fig. 3 Mean PAH concentrations in the samples analyzed
RW: rainwater, CF: ceramic tile roof run-off, AF: asphalt roof run-off, AD: asphalt road run-off

The PAH concentrations found in the run-off in this study were moderate compared with concentrations found in other studies.

PAH composition characteristics

Rainwater samples:
3-ring PAHs
Roof run-off samples:
3–4-ring PAHs
Road run-off samples:
4–6-ring PAHs

Table 4 Distributions (%) of the PAHs (grouped by the number of rings) in the samples (RW: rainwater, CF: ceramic tile roof run-off, AF: asphalt roof run-off, AD: asphalt road run-off)

Sample	2-ring PAHs	3-ring PAHs	4-ring PAHs	5-ring PAHs	6-ring PAHs
RW	12.0	50.9	23.3	11.2	2.5
CF	6.7	29.3	28.2	22.7	13.1
AF	3.6	30.2	32.3	21.6	12.3
AD	3.0	14.7	34.4	23.4	24.5

PAH source identification using positive matrix factorization

- Vehicular emissions and coal and gas combustion were the main sources of PAHs in the run-off samples.
- Energy consumption is the dominant factor affecting the PAHs in the run-off from impervious surfaces in the Shanghai urban area.

Table 8 Source contribution of PAHs in different impervious surface run-offs (%) (CF: ceramic tile roof run-off, AF: asphalt roof run-off, AD: asphalt road run-off)

Source	CF	AF	AD
Combustion	55.5	47.4	23.5
Vehicular emission	30.5	33.0	47.2
Petroleum		19.6	16.3
Others	14.1		13.1