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# Dry Deposition of Polycyclic Aromatic Hydrocarbons (PAHs) at a Suburban Site in Beijing, China

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A great amount of polycyclic aromatic hydrocarbons (PAHs) have been generated by industrial production, waste incineration and landfill, traffic and road dust etc. They are emitted into atmosphere and afterwards enter into water body and soil through deposition, resulting in wide distribution of PAHs in environment. However, the dry deposition of PAHs from atmosphere has not been well studied, especially in the aspects of its characteristics, environmental and health effects, sources and mechanism.

This study measured PAHs dry deposition in the northwest suburban area of Beijing. Dry deposition samples (i.e. dustfall samples) were collected at the sampling site located in China University of Petroleum - Beijing in 2012-2016. And PAHs in the samples were determined by GC/MS. The dry deposition flux of 16 US EPA priority PAHs (ΣPAH16) was 2.58 $\mu$g/(m$^2$·d), which was lower than those in other regions of North China. Its seasonal variability was more significant than annual variability ($p<0.05$) and the seasonal pattern was winter > spring > autumn > summer. The amount of ΣPAH16 removed from the atmosphere by dry deposition process accounted for only 1.2% of their emissions, indicating that the atmosphere self-purification capacity was quite limited and emission reduction measures would play a key role in controlling PAHs air pollution. However, PAHs dry deposition would deteriorate soil quality since the content of ΣPAH16 in dustfall was 1-2 orders of magnitude higher than that in soil in the same area. Dermal exposure resulting from PAHs dry deposition was not the major route. The sources of PAHs dry deposition varied with seasons. The profile and specific ratios of PAHs showed that in winter, domestic coal combustion was the main source of PAHs with the contribution up to 77%; in spring and summer, the impact of coal combustion decreased and the contribution of vehicle exhaust increased to 30% - 45%; in fall, in addition to coal combustion and vehicle exhaust, the impact of biomass burning was observed with the contribution of 20% - 40%. After the implementation of Beijing 2013 Clean Air Action Plan, the proportion of low-ring PAHs, tracers of coal combustion, decreased, reflecting the positive impact of policy. The mechanism of PAHs dry deposition mechanism was different from that of airborne particulate matter (PM). Dry deposition of PAHs in PM with aerodynamic diameter <0.69$\mu$m and >10.2$\mu$m was responsible for, respectively, 45% and 23% of PAHs in dustfall, and caused seasonal variability of PAHs dry deposition.

Key words: dry deposition; PAHs; suburban area; source; environmental effects; health risk

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