

中国上海市における大気中粒子状多環芳香族炭化水素及びニトロ多環芳香族炭化水素の経年変動特性

Recent variation characteristics of PM-bound polycyclic aromatic hydrocarbons (PAHs) and nitro-PAHs (NPAHs) in Shanghai, China

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【Objective】 Polycyclic aromatic hydrocarbons (PAHs) and nitro-PAHs (NPAHs) are ubiquitous environmental pollutants. PAHs originated from incomplete combustion processes of fossil fuel and biomass. Some NPAHs can originate from the secondary formation in the atmosphere in addition to the combustion process. Many PAHs and NPAHs are carcinogenic and mutagenic. With the growth of population and the advance of industrialization in China, the pressure of PAHs and NPAHs on the environment is increasingly heavy. In this study, we collected particulate matter (PM) samples in Shanghai, China in the warm and cold periods in 2013, 2015 and 2017/2018, respectively, and the goal was to clarify the recent variation characteristics of PAHs and NPAHs on the concentrations, compositions, emission sources and health risks.

【Method】 PM_{2.1} samples were collected using Andersen low-volume air sampler onto quartz fiber filters at a flow rate of 28.3 L/min. Each filter after pre-treatment, nine PAHs and three NPAHs including fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, benzo[ghi]perylene, indeno[1,2,3-cd]pyrene, 1-, 2-nitropyrenes (1-, 2-NPs) and 2-nitrofluoranthene (2-NFR) were determined using HPLC with fluorescence detection.

【Results and Discussion】 The mean concentrations of total PAHs and NPAHs were decreased year by year in the cold periods, while the variations in the warm periods were not obvious. The concentrations of each individual PAH and 1-, 2-NPs were higher in the cold periods, while 2-NFR showed the opposite result of 2017/2018. Several diagnostic ratios of PAHs indicated the potential emission sources were mixed, mainly affected by traffic emission and some from coal and/or biomass combustion in all sampling periods. The diagnostic ratio of [2-NFR] / [2-NP] indicated OH radical reaction was the main pathway for their secondary formation in Shanghai during the sampling periods.