Nitroaromatic hydrocarbons in ambient particles: Field observations and applications to a new tracer for anthropogenic secondary organic aerosols

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The transformation and origin of carbonaceous aerosols, particularly OAs, are complex, making their elucidation a major concern. Hence, measuring and analyzing chemical indicator components (tracer components) to determine the formation and origin of OA is critical. From the viewpoint of health effects, understanding its formation mechanism and actual conditions is also required to reduce PM2.5. Organic aerosols (OA) have been categorized into secondary (SOA) and primary OA (POA), with SOA being subdivided into anthropogenic SOA (ASOA) and biogenic SOA (BSOA). Of these types, ASOA is principally important in urban areas where anthropogenic emissions are abundant. Nevertheless, only a few effective organic tracer components exist for its analysis, limited to 2,3-dihydroxy-4-oxopentanoic and phthalic acids. Lately, nitroaromatic hydrocarbons (NAHCs) such as nitrophenols were detected in toluene-derived SOA in the presence of NOx in chamber experiments. Many of these components have nitro groups and thus have light-absorbing properties, that are considered important for the perspective of climate change. Therefore, we developed a method for the simultaneous multicomponent analysis of NAHCs, such as nitrophenols, nitrosalicylic acids, nitrocatechols, and nitronaphthols. Further, we analyzed the origin through NAHCs using filter-based field observations, including SOA samples from laboratory experiments. Investigations concluded that some NAHCs were important secondary organic components in the presence of NOx.

Keywords: Organic aerosols, Organic tracers, Nitroaromatic hydrocarbons

