

ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN AMBIENT AIR

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Most studies of emissions from combustion for energy generation have been aimed at abating inorganic emissions CO_x , NO_x and SO_x owing to the strict legislations to which these compounds have been subjected and because they are emitted in large amounts in comparison to organic emissions. Technical modifications to reduce inorganic emissions have affected organic emissions so that growing attention is being paid now to volatile organic compounds, particularly to polycyclic aromatic compounds (PACs) and, especially to polycyclic aromatic hydrocarbons (PAHs) owing to their carcinogenic character.

Although there is no definitive legislation concerning PAH abatement, the Environmental Protection Agency (EPA) has fixed 16 PAHs as priority pollutants, the last of which was included in 1997. These compounds are as follows: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, chrysene, benzo (*a*) anthracene, benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, benzo(*a*)pyrene, indeno(1,2,3-*c,d*) pyrene, benzo(*g,h,i*)perylene and dibenzo(*a,h*)anthracene. It is expected that air quality would improve soon if PAH emission was controlled. The simplest member of the PAH family is naphthalene, a two-ring compound which can be found in the vapour phase in the atmosphere. Three-, four-, and five-ring compounds can also be found in both the vapor and particulate phases in the atmosphere. PAHs consisting of five or more rings tend to be solids adsorbed onto other particulate matter in the atmosphere. A widely recognized five-ring PAH compound is benzo (*a*) pyrene. Naphthalene is by far the predominant airborne PAH. Night time concentrations of naphthalene are greater than daytime concentrations because of the hydroxyl radical reaction mechanism which removes naphthalene from the atmosphere in daylight. As ring size increases, the effect of this removal mechanism diminishes. These gaseous-phase reactions are important because they also lead to the formation of nitro-PAHs which are direct acting mutagens.

High volume air samplers equipped with polyurethane foam (PUF) adsorbent have been a standard device for monitoring semi-volatile organic compounds (SVOCs) in air for a number of years. In such samplers, air is drawn past a filter to retain particle-phase SVOCs and then past the PUF adsorbent to retain vapour-phase SVOCs. This sampling geometry has the potential to cause sampling artifacts, most notably "blow-off" whereby SVOCs which are adsorbed on particulate matter in ambient air may be volatilized from the particles after collection on a filter medium, thus enhancing the apparent vapour-phase concentration. A second effect which may occur is "blow-on" whereby vapor-phase SVOCs in ambient air are adsorbed on the filter media or on accumulated particulate and/or organic matter on the surface of the filter media. This would result in an apparent increase in the particle-phase loading of the SVOC in question. It is important to note that both of these phenomena can occur simultaneously.