SIMULTANEOUS SAMPLING OF GASEOUS AND PARTICULATE PAH BY MEANS OF AN ANNULAR DENUDER ~ MEMBRANE FILTER SYSTEM

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Polynuclear aromatic hydrocarbons exist in air both in the gas and particle phases, depending upon ambient temperature, substrate composition and partial vapour pressure and actual concentration of compounds. So, total PAH burdens are not fully represented by the aerosol-associated fraction, that implies the possibility of trace species to be far transported through air masses. Furthermore, total ambient toxicity assessment might take in account the weak carcinogenic and mutagenic components, present at relatively high concentration levels.

This is the reason of a recent concern about semi-volatile species (i.e. PAH and Nitrated-PAH), which partition at variable extent between free air and aerosol. By consequence, methodologies have been developed for collecting *total* amounts of target analytes or, better, for discriminating gas and particulate components. In the former case, the pollutants are collected from air by using a sampling train consisting of one membrane filter and one or more back cartridges; so, particle-associated compounds are retained by the filter, while semi-volatile components are captured by polyurethane foam plugs or adsorbent resin traps sited downstream. The sampling train becomes more complex whenever the true gaseous and particulate fractions of pollutants need to be discriminated. For this purpose, a pair of high-efficiency annular denuders coated with the sorbent material is located upstream of the particle filter, which is in turn followed by a second impregnated filter or a third coated denuder. Such a configuration serves to prevent from possible artefacts due to adsorption of the gaseous fraction onto particles already collected or by the filter itself (blow on) and to account for the partial volatilisation from the particulate filter (blow off), due to the shifting of equilibrium towards the gas phase during filtration.

We took the opportunity to separately collect gas and particle-associated atmospheric PAH through the use of a sampling set comprising two high-efficiency annular denuders and two filters; while the front filter was used as taken, the back one was loaded with XAD-4 resin.

By operating at a flow of 5 L min^{-1}, we observed important losses of 2- (and 3-) ring PAH in the gas phase when more than 15 m^3 of air were passed; by contrast, reducing the sampled volume to 2 m^3 also naphthalene was quantitatively collected on the front denuder. Similarly, since the air stream was freed from gaseous PAH, at long samplings partial evaporation of particulate PAH from the front filter occurred, so that these compounds were recovered on the back filter. Again, blow off was minimised when the air volume was reduced to some m^3. In this case, however, the capability of monitoring atmospheric PAH is determined by the reliability (including detection and quantification limits) of the analytical apparatus used. In our tests we adopted the HRGC-MS analysis, since a high sensitivity could be coupled with enough selectivity to discriminate analyte PAH from other hydrocarbon compounds.