Particulate Matter and PAH in the Milan Area

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Particulate matter $PM_{2.5}$ is a complex mixture of thousands of chemical compounds and many of these, though present only in small quantities, are of great interest due to their potential toxicity.
Attention has been focused on polycyclic aromatic hydrocarbons (PAH), ubiquitous air pollutants that play a role in the development of cancer. During a summer and a winter campaign, in the years 2000 and 2001, atmospheric samples were collected using 16.7 L/min inertial impactors with particle cut points of 2.5 and 10 μm, a sequential sampler and 4, 6, 24, 48 h sampling time.
Preliminary studies conducted in co-operation with industry showed an ultrasonic extraction technique to produce high recovery and good reproducibility, and to have the further benefit of not being time consuming. All the fine particulate matter filters were extracted by ultrasonic agitation with CH_3CN solvent and the samples, following extraction, were analysed for PAH in HPLC with a fluorescence detector.
The PAH concentrations in PM_{10} and $PM_{2.5}$ correspond to approximately 100% and 80% of the PAH concentrations in the total particulate.
The following table shows PAH mean concentrations in $PM_{2.5}$, obtained during the summer campaign (August-September 2000) and the winter campaign (February 2001).

COMPOUND	SUMMER CAMPAIGN ($ng\ m^{-3}$)	WINTER CAMPAIGN ($ng\ m^{-3}$)
Fluoranthene	0.07 ± 0.03	1.10 ± 0.37
Pyrene	0.10 ± 0.06	1.24 ± 0.36
Chrysene	0.10 ± 0.06	2.02 ± 0.77
Benz[*a*]anthracene	0.06 ± 0.03	1.29 ± 0.59
Benzo[*b*]fluoranthene	0.22 ± 0.13	3.19 ± 1.04
Benzo[*k*]fluoranthene	0.07 ± 0.04	1.32 ± 0.45
Benzo[*a*]pyrene	0.10 ± 0.07	2.42 ± 0.99
Dibenz[*a*,*h*]anthracene	0.06 ± 0.03	1.07 ± 0.41

We investigated the use of PAH for an estimation of the contribution, by gasoline and diesel vehicles, to the emissions of $PM_{2.5}$. Earlier studies had demonstrated that the emissions of these two types of vehicles have different characteristic PAH ratios and in order to verify whether these findings can be applied to field studies a third sampling campaign took place in March 2001. This sampling was carried out at a site where the traffic consists mainly of diesel vehicles, and we are now able to make a comparison of the ratios obtained at this site, those from the site of the February campaign (mainly gasoline traffic) and the values of the sources.

RATIO	Gasoline vehicles	Diesel vehicles	Gasoline site	Diesel site
fl/(fl+pyr)	0.41	0.51	0.46±0.05	0.49±0.05
b[a]ant/(b[a]ant+chrys)	0.41	0.21	0.38±0.04	0.31±0.06

fl: fluoranthene; pyr: pyrene; b[a]ant: benz[*a*]anthracene; chrys: chrysene.

The values of the ratios at the two sites are in good agreement with those of the sources. Therefore the method can be used to estimate the influence of the different composition of traffic in two or more urban sites.