Characterisation of the organic composition of size segregated atmospheric particulate matter at traffic exposed in summer and winter in Madrid

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The lack of prior information related to the organic composition of time series with size-segregated atmospheric particle matter in Madrid, concretely in urban areas, led to the definition of the goals of this study. In this perspective, summer and winter sampling campaigns were carried out. One of the sampling sites was located at a representative urban monitoring station (Escuelas Aguirre) belonging to the municipal network, located at a heavy traffic street intersection in downtown Madrid. Other sampling point was positioned within the CIEMAT area, located in the NW corner of the city, which can be considered an urban background or suburban site. Particulate matter was sampled with high volume cascade impactors at 4 size stages: 10-2.5, 2.5-1, 1-0.5 and <0.5 µm. Daily sampling was carried out on quartz fibre filters.

Based on meteorological conditions and PM mass concentrations, each one of the 7 groups of filters collected during the 1st week were combined with the corresponding filters of 2nd week. The same procedure was undertaken with samples of the others weeks in summer and winter. Filters of 1-0.5 and < 0.5 µm were pooled to obtain the PM_1 organic composition.

The PM size-segregated samples were subjected to organic analysis by gas chromatography-mass spectrometry (GC-MS), after solvent extraction of filters and an appropriate derivatisation technique. Besides the homologous compound series of organic classes, special attention was given to the determination of specific molecular markers for different sources (e.g. vehicular). All fractions were dominated by acids in both sampling sites and higher concentrations during summer except for PAHs at roadside. Pristane and phytane, both tracers of fossil fuel residues, were detected in all samples. Carbon preference indices (CPI) close to the unity express a significant input of compounds with anthropogenic origin. The presence of PAHs and alkane CPI values around 1 point out vehicle exhaust as the main emission source of the aliphatic and polycyclic aromatic fractions, especially for the roadside aerosols. Concentration of benzo(a)pyrene equivalent was

higher in the roadside than in urban background but in both sampling sites was below the OMS target (1ng.m^{-3}). Concentration ratios between PAHs were also used to assign emission sources. The abundance and the sources of these carcinogenic pollutants are discussed and compared taking into account the local/regional characteristics.

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