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## PAH DISTRIBUTION IN THE SIZE-SEGREGATED AEROSOLS OF A WORK OFFICE

*A. Cecinato, C. Balducci, P. Romagnoli, M. Perilli, M. Carratù, C. Perrino*

National Research Council of Italy, Institute of Atmospheric Pollution Research (CNR-IIA), Monterotondo  
Stazione RM, I-00015, Italy

*Presenting author email: cecinato@ia.cnr.it*

It is well known that most organic contaminants accumulate in the fine and ultra-fine fractions of airborne particulates. For instance, over 80% of high-boiling PAH and cocaine are associated to PM<sub>2.5</sub> (Cecinato et al., 2009). Nevertheless, this kind of tests has been carried out in the open air rather than indoors, although people spend there most of their life time. Furthermore, the features of indoor environments are peculiar, hosting a lot of active surfaces and emission sources for contaminants.

The distribution of PAH in the size-segregated aerosols of a work office was investigated at the CNR-IIA estate (Montelibretti RM, Italy). Two in-field experiments were performed, where ten size-segregated fractions of airborne particulates were collected both indoors and outdoors, from April 26 to May 3 and May 3 to 10, 2011. The office room (S = 3x4 m, h = 3.5 m) was kept unused during the former test, and used in the second.

Aerosols were collected by means of a pair of MOUDI systems, shaped to accumulate onto different quartz filter membranes particulate fractions corresponding to the following 50% cut-offs: S<sub>0</sub>: >18 µm; S<sub>1</sub>: 10 ÷ 18 µm; S<sub>2</sub>: 5.6 ÷ 10 µm; S<sub>3</sub>: 3.2 ÷ 5.6 µm; S<sub>4</sub>: 1.8 ÷ 3.2 µm; S<sub>5</sub>: 1.0 ÷ 1.8 µm; S<sub>6</sub>: 0.56 ÷ 1.0 µm; S<sub>7</sub>: 0.32 ÷ 0.56 µm; S<sub>8</sub>: 0.18 ÷ 0.32 µm; S<sub>9</sub>: < 0.18 µm. Aliquots (1.5 cm<sup>2</sup>) of active collecting surfaces were cut, to carry out the EC/OC analysis. The remaining were extracted with dichloromethane/acetone (4:1) by sonication, cleaned-up by alumina column chromatography and processed through GC-MSD (EI, scan mode) for the PAH evaluation. Perdeuterated PAHs were adopted as internal reference compounds for analysis. EC and OC were determined by applying the thermo-optical method.

According to the results, both total PAHs and benzo(a)pyrene were higher outdoors (2.39 and 1.55 ng/m<sup>3</sup>, 0.146 and 0.075 ng/m<sup>3</sup>, respectively) than indoors (0.57 and 1.29 ng/m<sup>3</sup>, 0.036 and 0.059 ng/m<sup>3</sup>), however meaningful differences were observed for the corresponding in/out ratios in the two tests (both ~0.25 and 0.80, respectively). Most of PAHs was associated to S5-S9 fractions. OC was similar indoors and outdoors (49 ± 2 and 38 ± 3 µg/m<sup>3</sup>) in both tests, and ca. 46% was associated to S7 and S8. As for EC (1.12 ± 0.20 µg/m<sup>3</sup> and 0.68 ± 0.06 µg/m<sup>3</sup>, respectively), more than 70% indoors and 50% outdoors was associated to S9 fraction.

This study was part of the EXPAH project, funded by European Commission in the frame of the 7<sup>th</sup> FP, LIFE+ Environment and Health Programme, aimed to elucidate the true exposure to PAHs and the corresponding impact on the health of humans, with special concern for sensitive segments of population (children and elders). The purpose will be reached by measuring both concentrations and indoor/outdoor ratios of carcinogenic congeners. Indoor experiments will be accompanied by measurements of PAH in reference outdoor stations, and of other recognized air pollutants.

Cecinato A., Balducci C., Nervegna G., 2009. Occurrence of cocaine in the air of the world's cities: an emerging problem? A new tool to investigate the social incidence of drugs? *The Science of the Total Environment* 407, 1683-1690.