

Evaluation of airborne polycyclic aromatic hydrocarbons from Itaparica Island, Bahia, Brazil

A. L. N. Guarieiro, G. O. da Rocha, L. dos S. Conceição, W. A. Lopes, P. A. de P. Pereira and J. B. de Andrade

¹ Chemistry Institute, Universidade Federal da Bahia, Campus de Ondina, 40170-029, Salvador-BA, Brazil

Keywords: Aerosol chemistry, airborne particles, measurements, PAHs, PM10

Particulate matter plays a significant role in the chemistry of the atmosphere and in human health. Several epidemiological studies have associated daily exposures to particulate matter with increased incidence of premature death, chronic asthma, increased hospital admissions and respiratory problems in children (Cho *et al.*, 2005). Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous and abundant pollutants that are emitted from several natural or anthropic sources and may be present in the atmosphere (also hydrosphere and lithosphere). The widespread occurrence of PAHs is largely due to their formation and emission during incomplete combustion of petrogenic materials such as oil, coal and wood as well as biomass burning due to agricultural practices. In urban areas, exhausts from diesel and gasoline vehicles play an important role to the PAH emissions (da Rocha *et al.*, 2009).

The PAHs are regarded as priority pollutants by both the US EPA and the European Community. While no standard currently exists in Brazil for PAH concentrations in ambient air, the U.K. government Expert Panel on Air Quality Standards is considering an air quality standard for PAHs of 0.25 ng m⁻³ (annual mean), to be achieved on December 2010 (da Rocha *et al.*, 2009).

The aim of this work was to determine the 16 priority PAHs in PM₁₀ samples collected from Itaparica County (12° 53' 18" S - 38° 41' 43" W) in Itaparica Island, Todos os Santos Bay (Northeastern Region of Brazil). Itaparica Island is a warm (annual temperature: 21.9 – 28.1° C), humid (annual pluviometric index: 1,800 a 2,200 mm yr⁻¹) and remote site, close to Salvador City (707 km² and 2,892,625 inhabitants) as well as the Petrochemical Pole of Camaçari (PPC). Depending on wind direction, Itaparica may receive air masses from these urban and/or industrial sites, respectively. 24hr PM₁₀ sampling was performed on 25th Apr to 3rd May 2008 (n=7).

Mean PM₁₀ concentration was 11.7 µg m⁻³ what is below Brazilian Standards (50 µg m⁻³ for 24 hr). Among all PAHs studied, only fluoranthene (FLT), pyrene (PYR), benz[a]anthracene (BaA), chrysene (CRY), benzo[b]fluoranthene (BbF), benzo[k]fluoranthene (BkF), benzo[a]pyrene (BaP), indene[123-cd]pyrene (IND), dibenz[ah]anthracene (DBA), and benzo[ghi]perylene (BgP) were above limit of detection. Total mean PAH level was 1.36 ng m⁻³. Individual mean PAH levels are found in Table

1. Total PAH dry deposition flux was achieved to be 0.417 µg m⁻² day⁻¹ (Table 1).

Table 1. PAH atmospheric levels (ng m⁻³) and dry deposition flux (F_d) (µg m⁻² day⁻¹) found in the PM₁₀ from Itaparica County.

| Species | Atmospheric level (ng m ⁻³) | Dry deposition flux (µg m ⁻² day ⁻¹) |
|--|---|---|
| FLT | 0.031 | 0.024 |
| PYR | 0.034 | 0.013 |
| BaA | 0.047 | 0.033 |
| CRY | 0.099 | 0.097 |
| BbF | 0.441 | 0.011 |
| BkF | 0.111 | 0.039 |
| BaP | 0.087 | 0.047 |
| IND | 0.210 | 0.148 |
| DBA | 0.048 | 0.067 |
| BgP | 0.199 | 0.104 |
| PM ₁₀ (µg m ⁻³) | 11.7 | - |

According to literature data, the ratios FLT/PYR (0.92), BgP/IND (0.95), and BaP/BgP (0.44), and IND/(IND + BgP) (0.54) were indicative of both heavy-duty and light-duty vehicles' releases as well as (BbF + BkF)/BgP (2.78) has shown domestic soot contribution to the found PAH levels. These ratio scores are in good agreement to those found in other previously studied sites also located in the Todos os Santos Bay (da Rocha *et al.*, 2009). Since Itaparica is a remote place having a very low automobile traffic and no other relevant PAH anthropic sources, we can conclude that it probably is a receptor site of PAH impacted air masses coming from Salvador City and/or Petrochemical Pole of Camaçari. However more investigations are being performed in this region to a better understanding of the topic.

This work was supported by the CNPq, CAPES, FAPESB, RECOMBIO, and PRONEX.

Cho, A. K., Sioutas, C., Miguel, A. H., Kumagai, Y., Schmitz, D. A., Singh, M., Eiguren-Fernandez, A., & Froines, J. R. (2005). *Environ. Res.*, 99(1), 40-47.

da Rocha, G. O., Lopes, W. A., Pereira, P. A. P., Vasconcellos, P. C., Oliveira, F. S., Carvalho, L. S., Conceição, & de Andrade, J. B. (2009). *J. of the Braz. Chem. Society*, submitted.