PAH in airborne particulate matter

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The concentration of polycyclic aromatic hydrocarbons (PAHs) in airborne particulate matter (PM) of urban aerosols was studied in Estonia. Samples of PM, particularly of the fine fractions (PM_{10} and $PM_{2.5}$), were taken from different locations in the capital city (Tallinn) and from oil shale mining and processing area in Northeastern part of Estonia. Average mean concentrations of fine particles, PM_{10} (less than 10 µm), were found to be 36.3, 27.9 and 19.4 µg/m^3, in the busy street (city center), industrial and residential areas, respectively. The distribution of very fine particles, $PM_{2.5}$, reaching human alveoli in lungs, was also observed. The organic fraction of PM was separated by the Accelerated Solvent Extraction. The final determination of 16 priority PAHs, according to the US EPA List, was performed by liquid chromatography (HPLC) method with Fluorescence detection. The range of mean concentrations of PAHs in fine particles ($PM_{2.5}$) was quantified from 2.5 to 6.2 ng/m^3, including benzo[a]pyrene, 0.1-0.7 ng/m^3. The composition of the PAHs fraction varied with the sampling location or the source composition. The domination of PAHs with molecular mass over 252, e.g., in decreasing order, Benzo[ghi]perylene, Indeno[1,2,3-cd] pyrene, Benzo[e]pyrene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene and Coronene in a busy traffic and industrial area of Tallinn confirm that the non-road engines and treatment of stored fuel of a cargo port are significant source of emission. Traffic's part as a contributing factor of air pollution decreases in the following sequence: busy street (city center, mainly light-duty motor vehicles), industrial and finally residential areas. In an industrial area of northeastern Estonia the distribution pattern of PAHs fraction were different from Tallinn. The dominating representatives were the homologues with the molecular mass less than 250, which are emitted mainly by stationary sources. The particulate matter appears to be a good indicator of the air quality, as the correlation coefficients between PM and selected PAHs were high. For the first time the air quality in Estonian capital city, Tallinn, and industrial area was assessed via sampling of fine particulate matter ($PM_{2.5}$) and chemical analysis of priority PAHs.