

POLYCYCLIC AROMATIC HYDROCARBONS AND OXYGENATED DERIVATIVES ON PARTICULATE MATTER: METHOD DEVELOPMENT AND APPLICATION IN CHIANG MAI, THAILAND

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An advanced gas chromatography high resolution mass spectrometry method was developed for the quantification of 16 polycyclic aromatic hydrocarbons (PAHs) and 12 oxygenated derivatives on atmospheric particulate matter with an aerodynamic diameter less than 10 μm (PM_{10}). The magnetic sector mass spectrometer was run in multiple ion detection mode (MID) using a mass resolution above 10 000 (10% valley definition). This allows for a selective accurate mass detection of the characteristic ions of the target analytes. Pressurized liquid extraction (PLE) using dichloromethane was evaluated at different extraction temperatures and excellent recoveries were obtained for the PAHs (87% - 98%) and oxy-PAHs (74% - 110%), when the optimum extraction temperature of 150°C was applied. The method was validated by analyzing a standard reference material (urban dust). The developed method was finally used to determine PAHs and oxy-PAHs concentration levels from particulate matter samples collected in Chiang Mai in Northern Thailand. This is the first time that oxy-PAHs concentration levels in Thailand are reported. The median of the sum of the PAHs concentrations (3.4 ng/m^3) and oxy-PAHs concentrations (1.1 ng/m^3) shows clearly the importance of the group of the oxy-PAHs as PM_{10} constituents. High molecular weight PAHs contributed the most to the ΣPAHs . Benzo[ghi]perylene was responsible for 30 to 44% of the ΣPAHs . The highest contribution to $\Sigma\text{oxy-PAHs}$ came from 1,8-naphthalic anhydride (26-78%), followed by anthracene-9,10-dione (4-27%) and 7H-benzo[de]anthracene-7-one (6-26%). Indications of the degradation of PAHs and/or formation of oxy-PAHs were found.

Keywords: PAHs, oxy-PAHs, PM_{10} , HRMS, Chiang Mai, Thailand