ESTIMATION OF BLACK CARBON CONCENTRATION IN FINE PARTICULATE MATER IN URBAN AERA

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ABSTRACT

Black Carbon (BC) is one of the most significant ingredient of atmospheric fine particle matter which is a global climate, air quality and human health concern. A precise and accurate determination of both the concentration and source contribution of BC in air particulate samples is very important and can provide key information for environmental management regulators and researchers. BC is typically formed through the incomplete combustion of fossil fuels, biofuel, and biomass, and is emitted in anthropogenic and naturally occurring soot [1, 2]. This work presents a first study in Bulgaria on BC estimation in urban fine particulate matter ($PM_{2.5}$). For evaluation of mass absorption coefficient (ε) and black carbon concentrations in $PM_{2.5}$ samples, the Multi-wavelength Absorption Black instrument (MABI) is used [3]. This instrument measures light absorption at seven different wavelengths, spanning ultraviolet to infrared (405nm, 465nm, 525nm, 639nm, 870nm, 940nm and 1050nm) which gives possibilities to differentiate the contributions from sources such as biomass burning (BC_{bb} or BrC) and motor vehicles-traffic (BC_{tr}). A methodology for the analysis of BC is developed. The MABI was applied to obtain BC concentration in $PM_{2.5}$ samples from filed campaign organized from June 2018 to July 2019 in Sofia. The comparisons between $PM_{2.5}$ mass and Black Carbon concentrations are presented and discussed. The $PM_{2.5}$ concentrations vary from 8.2 $\mu g.m^{-3}$ to 161.8 $\mu g.m^{-3}$. High correlation between $PM_{2.5}$ and BC_{tr} concentrations are obtained (R^2=0.87), suggesting domination of traffic contribution to $PM_{2.5}$ concentration. The range of BC_{tr} concentration is 0.4 $\mu g.m^{-3}$ - 16.6 $\mu g.m^{-3}$. The BrC concentrations are also calculated. The BrC varies 0.003 $\mu g.m^{-3}$ -1.8 $\mu g.m^{-3}$. It is found that 10% of the $PM_{2.5}$ mass is consisted from BC_{tr} and only 1.3 % is BrC. Variations in BC_{tr} and BrC concentration with in different meteorological conditions are also presented.

Keywords: Black carbon, $PM_{2.5}$, urban air pollution.

References

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