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BOOK OF ABSTRACTS

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Evaluation of black carbon in fine atmospheric particulate matter on various filter types by multi-wavelength light absorption technique

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Besides the evident harmful impact to human health, black carbon (BC) is considered as second important contributor to climate change due to its sunlight absorption and warming effects. It is a major component of fine atmospheric particulate matter emitted during the incomplete combustion of fossil fuels and biomass burning emissions from both natural and anthropogenic sources. Atmospheric carbon was recognized in forms of soot, black carbon, elemental carbon, inorganic carbon, organic carbon, brown carbon, etc, depending on the origin and absorption characteristics. Measurement methodologies for BC analysis in aerosol samples are mostly based on optical and thermal properties of carbon species. Here are presented results of the application of the optical analytical technique which relies on the multi-wavelenght light attenuation by black carbon component of fine particulate matter deposited on filter media. For that purpose, standard polytetrafluoroethylene (PTFE), quartz and carbon nanotube filters with different qualitative features and pore diameters were exposed to fine aerosol fraction at urban background monitoring site in heating and non heating seasons, using low-volume air samplers with 2.3 m^3/h air flow. A multi wavelength absorption black carbon instrument (MABI) with 405 nm, 465 nm, 525 nm, 639 nm, 870 nm, 940 nm and 1050 nm LEDs was used for blank and exposed filters analysis and black carbon evaluation. Differences in obtained BC values are discussed in relation to various absorption potential of different filter media, taking into account absorption coefficients dependence on the wavelength and density. Main advantage of this method is simplicity and complementarity with non-destructive nuclear analytical techniques (EDXRF, PIXE) for elemental analysis of fine aerosol fraction on specific filter media. Differentiation between black carbon coming from fossil fuels combustion and from biomass burning sources would be additional information valuable for source apportionment analysis using positive matrix factorization and reliable discussion of air pollution observed at selected receptor site.

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