COMPARISON OF COMMON FILTER MEDIA AND THERMAL PROTOCOLS USED IN EC - OC ANALYSIS

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EC - OC analysis of PM suspended on quartz fiber filters is sensitive to a number of parameters, among which the thermal protocol and the specific filter media selected. Filters may vary in specifications, composition and behavior during sampling, handling, conditioning and analysis. Three common type of filters were selected for comparison: Whatman QMA, Pall Tissuquartz 2500-QAT and Munktell MK360. Thermal protocols applied involve a sequence of steps varying in temperature and duration that may alter the sample treatment and affect the analysis outcome. EUSAAR2, IMPROVEA and NIOSH870 are three frequently used protocols and therefore included in our comparison.

Three identical Derenda sequential low volume samplers were installed at the A10 Ring Zuid highway monitoring site of the Air Quality Monitoring Network of Amsterdam. Each sampler was loaded with 15 filters of one type, 7 of which field blanks, and was set to sample 2.3 m^3/h ambient air through an EU PM2.5 inlet for 8 periods of 24-hours. The filters remained in the sampler for another week in order to simulate the 15th day sampling cycle and field blank exposure routinely applied by monitoring networks. Two subsets of filters were handled and analyzed by a different approach: The first subset followed the handling and weighing procedure as described in EN 12341 while the second was stored directly to petri slides until EC - OC analysis.

Handling resulted occasionally in higher OC concentrations on blank but not on loaded filters. EC and Pyrolytic carbon (PC) concentrations were found higher for IMPROVEA, followed by EUSAAR2 and NIOSH870. MK360 showed higher OC concentrations on both loaded and blank filters. Further tests showed that after a 2-minute flow, blank concentrations would decrease for QMA and Tissuquartz but not for MK360. The use of QMA resulted in lower PC and indicated pre-oxidation, possibly related to the high concentrations of earth alkali and alkali metals as found by additional elements analysis on blank filters. This comparison shows that significant differences in analysis results can be determined even for the nominal same filter material needed for thermal/optical analysis of EC - OC.

The current work was performed within the laboratory tests, part of the mandate for the development of standardized methods on the measurement of airborne EC and OC in PM2.5 and for the elaboration of a European Standard (CEN / TC264/WG 35).