Atmos. Chem. Phys. Discuss., 5, S987–S989, 2005
www.atmos-chem-phys.org/acpd/5/S987/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Combustion characteristics of water-insoluble elemental and organic carbon in size selected ambient aerosol particles" *by* K. Wittmaack

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Received and published: 31 May 2005

General Comments

The paper presents an alternative method to separate organic carbon (OC) and elemental carbon (EC) in ambient aerosol samples. The method utilises size segregated sample collection on aluminium impaction substrates combined with aqueous sample extraction and analysis by scanning electron microscopy (SEM) and energy dispersive X-ray analysis (EDX). The method was developed to reduce measuring artefacts. Diesel soot particles were found to be combusted in a narrow temperature range between 490°C and 510 °C, leaving residual ash particles of approximately 10 nm in size.

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In contrast to diesel soot particles, organic carbon containing particles were found to be combusted over a wide range of temperature between 200°C and over 600°C, also beeing prone to incomplete combustion.

This method is a notable step forward in the difficult field of EC/OC-differentiation in ambient aerosol and should therefore be published in ACP. Nevertheless, some minor changes should be considered.

In common thermal analysis of EC and OC with or without optical correction, charring of biogenic material presents a major problem (Lavanchy etal., 1999; Schmid etal., 2001). The paper does not discuss the findings with regards to this aspect. Also the presence of humic like matter is not considered. The presence of diesel soot particles is purely judged by the particle shape in the SEM pictures. Additional particle analysis, for example by Raman spectroscopy, could improve the quality of the data set (see e.g. Sadezky et al., 2005). It would also be interesting to have a direct comparison to results from Diesel soot obtained by this method. The author concludes that the results presented in this paper can be used to interprete peaks of thermograms of ambient aerosol. It should be noted that this would only be possible in combination with the presented method due to the great variability of ambient aerosol.

Specific Comments

Section 2 - Methods: This section contains an evaluation of the method besides the actual method (rows 1 - 9 and 19 - 25). These comments should be included either in the introduction or the conclusion part of the publication. It needs to be stated in the method part, how the impactor was operated with regards to the impaction plates. How was the particle “bounce off” effect prevented (greasing of substrates, humidifying of the aerosol, other?)

Fig 2. Preferably pictures a to c should be from the same stage to give a better inter-comparability.

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Section 3.1 - Coarse description of samples. A mean mass density of 2g/cm3 and a uniform distribution of the arosol matter were assumed. What are these assumptions based on?

Section 3.2. - SEM analysis, Fig. 6. With regards to a bioaerosol “the interesting aspect here is that heating at 430°C did not cause complete but only partial combustion .” Here the charring aspect should be considered!

Section 3.3 - EDX analysis Fig.9 The silicon graph of stage 1 is in difference to the other stages not antidromic to the corresponding carbon graph. This should be discussed.

Technical Comments

Section 3.1 - Coarse description of samples. “Rough” should be used instead of “Coarse”.

References:

Lavanchy, V.M.H. ; Gäggeler, H.W. ; Nyeki, S.; Baltensperger, U. (1999) Elemental carbon (EC) and black carbon (BC) measurements with a thermal method and an aethalometer at the high-alpine research station Jungfraujoch. Atmospheric Environment, 33, 2759 - 2769

Sadezky etal. (2005), Raman microspectroscopy of soot and related carbonaceous materials: Spectral analysis and structural information. Carbon, doi:10.1016/j.carbon.2005.02.018

Schmid, H.; Laskus, L.; Abraham, H.J.; Baltensperger, U.; Lavanchy, V.; Bizjak, M.; Burba, P.; Cachier, H.; Crow, D.; Chow, J.; Gnauk, T.; Even, A.; ten Brink, H.M.; Giesen, K.-P.; Hitzenberger, R.; Hueglin, C.; Maeghaut, W.; Pio, C.; Carvalho, A.; Putaud, J.-P.; Toom-Sauntry, D.; Puxbaum, H. (2001) Result of the “carbon conference” international aerosol carbon round robin test stage I. Atmospheric Environment, 35, 2111 - 2121

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 2247, 2005.