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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A novel tandem differential mobility analyzer with organic vapor treatment of aerosol particles" *by* "J. Joutsensaari et al."

Anonymous Referee #2

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General comments:

The study presents a modified Tandem DMA approach, which aims at a determination of the aerosol organic fraction. The modified TDMA uses organic vapour instead of water vapour as a working fluid in order to investigate the particle growth behaviour due to the organic vapour. The observed uptake of organic vapour by the particles is considered as an indicator for the presence of an organic aerosol fraction. The application of the OTDMA to test aerosols of various composition demonstrates the principal feasibility of the method, although the applicability to atmospheric internally mixed particles is not shown. The expected benefit of an OTDMA application for the characterisation of the organic fraction of the atmospheric aerosol cannot be estimated from the pre-

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sented results. Additional material on the instrument response to an internally mixed aerosol would be of great help.

The paper is scientifically sound and fits largely into the scope of ACP. Abstract, introduction and description of the experimental approach are well structured and clear. Before final publication in ACP, the following comments and concerns need to be addressed.

Specific comments:

1/ Section 4 - Results and discussion. I recommend to list the values which were used for the calculation of the theoretical growth factors. Although the CRC Handbook of Chemistry and Physics is given as the main reference, it would help the reader if all used values are summarised for instance in an additional table.

2/ The authors state the observation of a deliquescence transition for adipic acid/ethanol (Fig. 3b). This transition is not obvious because in contradiction to the observed deliquescence transitions for sodium chloride/water and ammonium sulphate/water (Fig. 2) there are no data for liquid adipic acid particles when the ethanol saturation ratio is increased. The same statement holds for the observation of recrystallized adipic acid particles at decreasing ethanol saturation ratio. The TDMA technique permits the observation of this hysteresis effect in the case of water vapour induced particle growth. Why is this not the case for the OTDMA set-up? I consider this issue as crucial, because the adipic acid/ethanol system is the only investigated system which shows a clear difference between water vapour induced and ethanol induced particle growth. In the case of citric acid there is no difference between these two vapours. Since the ambient air concentration of ethanol is supposed to be negligible I expect that OTDMA spectra always will start on 'solid' organic particles, i.e., on the non-growing branch of the hysteresis curve. How would this influence the applicability of an OTDMA to ambient aerosol? The authors already stated that it might be advisable to start at high ethanol saturation ratios close to unity, but a simple test run on ambient aerosol might add some more data to demonstrate the applicability of this

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1, S26–S28, 2001

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approach to ambient particles.

3/ A careful discussion of the instrument response to internally mixed particles is strongly recommended. For the same reason, the conclusions considering the ability of the OTDMA to categorise ambient particles in terms of the organic content should be softened.

Interactive comment on Atmos. Chem. Phys. Discuss., 1, 1, 2001.