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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."

J. Joutsensaari et al.

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Response to specific comments by Referee #1

1. Although the polarity of water and ethanol are similar, ethanol dissolves many organic species in which water is insoluble. We think that for the first version of the OT-DMA it is more useful to apply as universal a solvent of organics as possible, rather than to apply a (nonpolar) solvent which dissolves a more limited number organic species. We agree that in atmospheric measurements, use of a solvent which dissolves only a narrow range of species would lead to a clear distinction of those species, but information of the overall organic content would not be achieved. The best strategy would of course be to use an array of TDMA's with different solvents. Concerning hexane and methylene chloride, we are afraid that these solvents are not practical for the TDMA

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because of their high vapor pressure.

2. We will check whether using a diffusion dryer alters the citric acid results.

3. It is true that grown particles can in certain circumstances be droplets of pure liquid with an insoluble condensation nucleus, but if the particles grow in undersaturated vapor (which is the situation discussed in the theory section), they necessarily have to be solution droplets (which of course could contain solid inclusions).

4. OK

5. First of all, we believe that construction of an experimental apparatus which, albeit based on an existing technique, can be used for a new type of measurement, and demonstration of the functionality of the measurement principles, constitute a sufficient amount of material for a publication. That said, we agree that measurements with mixed particles would have been useful, and we only omitted them because of time constraints - after the measurements shown in the paper were completed, the instrument has been used in smog chamber and field campaigns, and we have had essentially no time for additional lab measurements. Waiting for a chance to make the additional measurements would have ment delaying the publication of the existing results by an unacceptable amount of time. Fortunately, we have results from the smog chamber experiments showing that internally mixed particles of ammonium sulfate and organic species behave as we would expect - their growth factor in ethanol increases as a function of organic mass fraction, whereas the growth factor in water vapor shows the opposite trend. These results, as well as results concerning internally mixed laboratory particles, will be published separately. Chemical analysis, unfortunately, does not always lead to "thorough characterization"; for example it is very common that a high percentage of mass collected on impactors remains unidentified, and single particle mass spectra often contain peaks which cannot be attributed to any known species. Clearly, TDMA methods can provide complementary information even when chemical analysis is performed.

6. Yes, the heading of the third column in table 1 should read "ethanol" instead of "organic". By the way, DMSO would be a good candidate for a solvent used in TDMA.

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