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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."

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General comments

The paper by Joutsensaari et al. reports a very interesting development in TDMA technology, which may become a useful tool in the characterisation of atmospheric aerosols. As already pointed out by the referees (ACPD, 1, S18, 2001; ACPD, 1, S26, 2001) the practical applicability remains to be proven, and hopefully the follow-up publication on smog chamber and field measurements announced by the authors (ACPD, 1, S29, 2001; ACPD, 1, S44, 2001) will answer this question. In addition to the issues already addressed by the referees, the following aspects should be considered upon revision of the original paper before publication in ACP.

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Specific comments

As shown in previous TDMA studies, the interaction of diesel and spark discharge soot particles with water vapor can under certain conditions lead to a significant mobility diameter reduction by rearrangement of the fractal particle structure (e.g. Weingartner et al., J. Aerosol Sci., 2311-2327, 1997). While such effects are clearly beyond the scope of the present paper, it will be interesting to see in future investigations what happens to fractal particles upon interaction with ethanol and other organic solvent vapors.

Along these lines and concerning the use of the term "droplet", I agree with Referee #1 that it is not well suited for the definition of the term "growth factor" (p.10, l.15 and l.19). Growth factors can also be calculated for solid particles which have not taken up a significant amount of the vapor species but just changed their structure by adsorption and surface effects as mentioned above. On the other hand also growth factors significantly larger than unity can result from uptake of the vapor species into a relatively thin aqueous or organic surface layer on a refractory core accounting for most of the particle volume. In fact, I would expect that a substantial fraction of the atmospheric particles growing by uptake of organic solvent vapor (e.g. soot particles and primary biogenic particles) will behave like that rather than forming a liquid droplet like salt particles deliquescing in water vapor. Thus I would suggest to speak of "grown particles" or more general of "conditioned particles".

Finally, it should be considered that not only solubility and physical uptake will play a role in the interaction of atmospheric particles with organic solvent vapors, but also chemical reactions may occur. For example, sulfuric acid is known to chemically transform organics by oxidation and acidic catalysis of various other types of reactions, which might complicate the interpretation of atmospheric measurements. The authors' reply to Referee #2 (ACPD, 1, S44, 2001) indicates that they are already aware of this issue, and it should definitely be mentioned in the revised manuscript and investigated in future experiments.

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

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