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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A method for detecting the presence of organic fraction in nucleation mode sized particles" *by* P. Vaattovaara et al.

Anonymous Referee #1

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GENERAL COMMENTS

The manuscript presents results from the application of an ultrafine organic tandem differential mobility analyser (UFO-TDMA) to organic and inorganic laboratory test aerosols. Aim of the study is the verification of different growth behaviour of organic and inorganic ultrafine particles (D $<$ 10 nm) when they are exposed to ethanol vapour at controlled saturation ratios from 72% to 88%. This different growth behaviour shall then be used to gain insight on the chemical composition of ultrafine particles under atmospheric conditions. The authors investigated the growth behaviour of particles composed of ammonium bisulphate, sulphuric acid, citric acid, tartaric acid, and benzoic acid. Their main conclusion is that particles smaller than 10 nm in diameter do not

grow with increasing ethanol saturation ratio if they are composed of inorganic components. However, organic particles show growth factors of up to 1.6 at S = 0.88. The picture is no longer that clear for particles in the small-size tail of the Aitken mode (10 nm $<$ D $<$ 50 nm), because particles grow independent of their dry size.

The manuscript presents results from a successful application of a promising technique to an important topic in atmospheric aerosol research. The paper is of high scientific significance and quality and deserves thus publication in ACP after minor changes which are discussed in the following. The presentation of the material is well organised and needs no revision.

SPECIFIC COMMENTS

Concerning the graphs, I recommend similar scales on X- and Y-axes for all growth factor plots (Figs. 2 - 9). Scaling X-axes from 72% to 88% and Y-axes from 0.95 to 1.6 makes an intercomparison of different growth factors for the reader much easier. I also recommend to increase the size of the symbols in the plots and to reduce the number of tick labels on the X-axes. Furthermore, I suggest adding theoretical growth factors calculated from Kelvin theory for a few substances where required thermodynamic properties are available. Those theoretically predicted values can then be used as benchmarks for a discussion of observed growth factors.

The discussion of results focuses mainly on the 10 nm sized particles. Going through Figs. 2- 9, I get the impression that the method does not work for particles larger than 10 nm because the growth factors are very similar for organic and inorganic substances. Please comment on that observation with some more detail than in the current version. Again, calculations from Kelvin theory would help to justify your arguments.

Typographic errors:

Abstract, 3rd sentence: “... the presence of an organic fraction ...”

Introduction, 2nd paragraph, 2nd sentence: “... needs to be characterised.”

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Introduction, last sentence: “... to grow under those conditions.”

Results, 4th paragraph, 1st sentence: “..., when the particle diameter is 50 nm and the saturation ratio is about 85%.”

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 3595, 2005.