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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The vapor pressures and activities of dicarboxylic acids reconsidered: the impact of the physical state of the aerosol" *by* V. Soonsin et al.

Anonymous Referee #1

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This manuscript describes measurements of vapor pressures of the organic component of binary organic/aqueous droplets at varying water activity, focussing on the homologous series of dicarboyxlic acids C2 to C5. This represents a continuation of research that has often led to conflicting interpretations of the physical state of the aerosol particle from which the organic component is evaporating. In past studies, a range of thermodynamic treatments have been used to estimate the activity coefficients and activities of the organic components with varying water activity. This has also led to some discrepancies between the reported vapor pressures of the dicarboxylic acids. This paper provides a rigorous and comprehensive examination of the vapor pressures of this homologous series of dicarboxylic acids and is conclusive in resolving past dis-

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crepancies. The manuscript is well prepared and I have only a few minor comments that the authors should consider.

(1) Even though the estimation of vapor pressures of solid particles has been described in detail previously, it would be helpful if more specific details were included in this manuscript. From the authors' previous Optics Express article, it is clear that the simulating the particle morphology is key to retrieving vapor pressures. However, there is very little information given in this manuscript, for example, as to what the radius actually means for a particle that is presumably non-spherical.

(2) Given the uncertainties in estimating vapor pressures from the resonance spectrum for solid particles, the authors should say why they used this method to retrieve the evolving radius of the particle, rather than measuring the mass directly from the DC balancing voltage in the EDB measurement.

(3) The argument made that the relative evaporation rates recorded are those for amorphous and crystalline glutaric acid in Figure 4 is convincing. Figure 9 shows a similar diagram for succinic acid that includes the efflorescence point. It would be helpful if the glutaric acid data set were presented in the same way. In Figure 9, it is unclear from the caption what time periods the two lower evaporation rates were determined over.

(4) An article has recently appeared in the Journal of Physical Chemistry A (ASAP) which appears to present vapor pressures of dicarboyxlic acid components with and without an inorganic component by Clegg and Cox (DOI: 10.1021/jp1052979). It might be appropriate to consider the consistency of this work with the current study.

Minor typographical/grammatical errors: (1) Line 15 page 20517 and lines 3 and 7 page 20518: These sentences using the words 'allow(s) to' are grammatically incorrect and should be reworded as 'over binary solutions allow the organic activity to be directly obtained. . .', 'only techniques which allow the vapor pressures of semivolatile substances to be determined. . .', and '. . .that it allows the unambiguous identification of the physical state. . .'

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(2) Line 4 page 20527: sentence starting ‘Because’ does not make sense.

(3) Figure 3 caption: the filled square symbol should be a circle.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20515, 2010.