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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Toward closure between predicted and observed particle viscosity over a wide range temperature and relative humidity" *by* Sabin Kasparoglu et al.

Anonymous Referee #2

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Review of "Toward closure between predicted and observed particle viscosity over a wide range of temperature and relative humidity" by Kasparoglu et al.

This paper compares measured viscosities for sucrose and citric acid particles with predicted viscosities based on a semiempirical model. This comparison is needed to test the accuracy of the semiempirical model for predicting viscosity of atmospheric aerosols. In general, closure is observed between the measured viscosities and predicted viscosities, although additional tests of the semiempirical model are needed, as pointed out by the authors.

Since viscosity of atmospheric aerosols is related to several important atmospheric

processes (e.g. ice nucleation, gas-particle partitioning, and heterogeneous chemistry), this paper is appropriate for ACP. The paper is rigorous, insightful, and provides an underpinning for future predictions of viscosity in atmospheric models. The paper is clearly written, and the scientific quality of this paper is in the top 10 % of the field. I recommend this paper for publication in ACP, after the authors have adequately addressed the comments below.

Comments:

Page 4. Lines 95 – 98. The dimer, coagulation, isolation, and coalescence (DCIC) method was used to determine coalescence relaxation of dimers consisting of polyethylene monomers and sucrose or citric acid monomers. Coalescence relaxation times were then converted to viscosities using the Frenkel sintering theory. However, Frenkel sintering theory is developed for two dimers of identical composition, which is not the case in the current study. The application on Frenkel sintering theory does not seem appropriate for the current study. The authors need to justify the use Frenkel sintering theory for interpretation of coalescence relaxation times of two different monomers.

Table 1. Surface tensions of 0.065 and 0.08 J/mˆ2 were used for citric acid and sucrose, respectively. I assume that the surface tensions are dependent on water content. Was this taken into account when calculating viscosities?

Page 6, line 146. "The effect of particle curvature on water content is not considered". Is it reasonable to ignore the curvature effect?

What is the uncertainties in the viscosity values listed in Table 2?

The authors refer to Figures 1, 2, etc. in the supporting information. Should this be Figures S1, S2, etc.

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