Atmospheric Chemistry and Physics Discussions

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Comment on acp-2022-74

Anonymous Referee #1

Referee comment on "Viscosity and physical state of sucrose mixed with ammonium sulfate droplets" by Rani Jeong et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-74-RC1, 2022

This manuscript reports measurements of the viscosity of internal mixtures of sucrose and ammonium sulfate as a function of relative humidity across a range of organic to inorganic mixing ratios. The results are compared with the predictions from the AIOMFAC-VISC model.

Overall this is a nice piece of work applying established methods to quantify viscosity in a previously under-explored chemical system. The observations are clearly presented and the interpretations are well-supported. The manuscript is well-written and the figures are effective in conveying the relevant data.

One area that could warrant a deeper discussion and further expand the scope of this work is that of the induced efflorescence of supersaturated mixtures that are rich in AS. The assertion is that the needle allows nucleation of a crystal phase. In particles that also contain sucrose (Figure 3d), the solid phase that nucleates appears to be multiphase. Can the authors discuss the phase of these particles? Are they phase-separated (i.e. AS rich domains and sucrose-rich domains), gel particles (e.g. solid with aqueous / viscous fluid in the void space), well-mixed etc.?