Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-19-RC1, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Liquid-liquid phase separation in secondary organic aerosol particles produced from α-pinene ozonolysis and α-pinene photo-oxidation with/without ammonia" *by* Suhan Ham et al.

Anonymous Referee #1

Received and published: 28 February 2019

The paper "Liquid-liquid phase separation in secondary organic aerosol particles produced from alpha-pinene ozonolysis and alpha-pinene photo-oxidation with/without ammonia" by Ham et al. characterizes the presence or absence of LLPS at high relative humidities under certain experimental conditions, as expressed in the title. The data are compelling and the writing is clear. This study builds directly on the corresponding author's prior work in this area. These systems are expected to impact the formation of CCN, and as a result, are relevant to the audience of Atmospheric Chemistry and Physics. My one main concern about the paper is that the conclusions are

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too far reaching. In particular, the authors relate their findings to the O:C ratio needed for LLPS without measuring the O:C ratio for their systems.

major comments Section 3.4: How much does the O:C vary for oxidation in different chambers or flow reactors under the same reactant concentrations? I am skeptical that conclusions about O:C and LLPS can be reached in this paper because there is no direct measure of the O:C of the aerosol particles.

How relevant is it to have aerosol particles just composed of secondary organic material with no other species?

minor comments pg 3, line 2: You could add Rastak et al. 2017, Hodas et al. 2016, Altaf et al. ACS Earth & Space Chem 2018 here as well.

pg 3 line 12: Really, too few systems (5) have been studied so far to define these boundaries in comparison to the number of systems explored for LLPS in the presence of inorganic salts.

pg 4 line 14: I don't understand these two different timescales. Do these correspond to different residence times in the flow cell? Only one number is given for residence time.

pg 4: How similar are the concentrations of alpha-pinene and ammonia to atmospheric concentrations?

pg 4: How much O3 is expected to be converted to OH? What is the concentration of O3 in the flow reactor? What are the expected rate coefficients for alpha-pinene oxidation with OH vs. O3?

pg 6, line 12: I don't understand how the written sentences leads to this subset of references on LLPS. Be more specific about the "consistent results" that this paper has in common with those cited.

pg 6, line 18: Is the mass concentration at SOA provided for a specific RH?

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