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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigation of molar volume and surfactant characteristics of water-soluble organic compounds in biomass burning aerosol" *by* A. Asa-Awuku et al.

Anonymous Referee #1

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This manuscript applies the newly developed Kohler Theory Analysis (KTA) method to estimate the average thermodynamic properties (i.e., molar volume, molecular weight) for organic species obtained from collected aerosol particles. The analysis relies on CCN activity and surface tension measurements which help eventually to estimate the average molecular weight of these organics. It is shown that the more hydrophobic fractions of these organics are more surface-active then the low molecular weight hydrophilic part, and may represent humic like species (HULIS). The manuscript also makes a nice use of the salting out effect in order to probe the effect of surface tension on activation. In addition, the authors provide an estimate of the molecular weight of the organic species, which suggests evidence for atmospheric processing. The paper

is clearly written and provides a very thorough and relevant analysis. It should be of great interest to the readership of ACP. The paper, however, falls short in discussing relevant studies that were published recently which either used similar approach or can constrain some of the uncertainties that are inherent in the analysis used here, such as the assumption of the density and van't Hoff factors. The authors should also add a better discussion of the possible range of values in their derived parameters, in light of the assumptions made and the previous measurements. Therefore I suggest that the paper will be accepted to ACP after the authors add the relevant discussions, as outlined below:

1. Surface tension is a time dependent phenomenon (Slama et al JGR 2007). What value of the surface tension was used in the calculation (is it the one after an equilibration time?) and how relevant is it to cloud droplet growth? If it is indeed attained on cloud droplet activation times used here, what does it mean in terms of the dissolution kinetics and diffusion to the surface?

2. Recently, Wex et al (GRL 2007) used a similar approach for reaching CCN closure of HULIS containing aerosols. The authors should cite this paper and discuss the similarities and difference of the two approaches and their results. Discussion with respect to Petters MD (Tellus 2006) should also be included.

3. P3591 L17, Add reference to Decesari et al, ES&T 2007, who carried out detailed functional group analysis of HULIS from various sources.

4. P3591 L27, add reference to surface tension measurements of HULIS by Kiss et al(J Atmos Chem 2005) and Salma et al (JGR 2007).

5. P3592 L8,add references to Graber and Rudich, and various studies by Markus Kalberer and by Gyula Kiss who looked HULIS in various environments and the annual variations.

6. P3604 L5. Explain the value used for density and relate to measurements by Dinar

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et al (ACP 6, 5213-5224, 2006) of higher densities measured for HULIS. If there is no better assumption, discuss possible errors on the conclusions that could result from this assumption.

7. P3604 L13.There is no indication in the data that the concentration exceeds the CMC. Explain the statement.

8. P3604 L25, Dinar et al (J. Geophys. Res., D112, doi:10.1029/2006JD007442, 2007. and .ACP, 6, 2465-2482, 2006) provide estimates to the amount of dissociation in the HULIS samples they studied. Discus the assumptions for the van't Hoff factor used in this study in light of these observations and the possible error associated with this assumption.

9. Page 3606, line 8: the very last parameter should be indexed "j", not "i"

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3589, 2007.