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Atmospheric Measurement Techniques Discussions

Interactive comment on "Dry versus wet? Implications on aerosol impaction and organic volume fraction" *by* Hansol D. Lee et al.

Anonymous Referee #2

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The authors describe the effect of dry and wet deposition on the mixing states of organic/NaCl particles using atomic force microscopy and bulk ensemble HPLC. The result can provide additional insight for the mixing state of aerosol particles which is still unknown in the atmospheric community. However, some results are not convincing and need more explanation.

1. Title should describe the topic and key words of the paper. 'Dry versus wet' is too simple. Also 'Implications' is not a main content of this paper. Please reconsider the title.

2. The authors selected glucose-NaCl mixtures as a model system consisting of a core-shell morphology. I am confusing whether the mixture really showed a core-shell morphology. Previous studies have established that particles containing organic/inorganic

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salts underwent phase separation when the O:C of the organic material was smaller than ∼0.8 (Bertram et al., 2011; Krieger et al., 2012; Song et al., 2012; You et al., 2013; You et al., 2014). Since the O:C of glucose is 1.0, I expect the particle is present in one phase before NaCl effloresces. Once the particle reaches low relative humidity, it would show that nucleation of NaCl initiates effloresce process over the particle. The authors should state the discrepancy in the previous work in detail.

Bertram, A. K., Martin, S. T., Hanna, S. J., Smith, M. L., Bodsworth, A., Chen, Q., Kuwata, M., Liu, A., You, Y., and Zorn, S. R.: Predicting the relative humidities of liquid-liquid phase separation, efflorescence, and deliquescence of mixed particles of ammonium sulfate, organic material, and water using the organic-to-sulfate mass ratio of the particle and the oxygen-to-carbon elemental ratio of the organic component, Atmos. Chem. Phys., 11, 10995-11006, DOI 10.5194/acp-11-10995-2011, 2011.

Krieger, U. K., Marcolli, C., and Reid, J. P.: Exploring the complexity of aerosol particle properties and processes using single particle techniques, Chem. Soc. Rev., 41, 6631-6662, 10.1039/c2cs35082c, 2012.

Song, M., Marcolli, C., Krieger, U. K., Zuend, A., and Peter, T.: Liquid-liquid phase separation in aerosol particles: Dependence on O:C, organic functionalities, and compositional complexity, Geophys. Res. Lett., 39, Artn L19801, Doi 10.1029/2012gl052807, 2012.

You, Y., Renbaum-Wolff, L., and Bertram, A. K.: Liquid-liquid phase separation in particles containing organics mixed with ammonium sulfate, ammonium bisulfate, ammonium nitrate or sodium chloride, Atmos. Chem. Phys., 13, 11723-11734, 10.5194/acp-13-11723-2013, 2013.

You, Y., Smith, M. L., Song, M. J., Martin, S. T., and Bertram, A. K.: Liquid-liquid phase separation in atmospherically relevant particles consisting of organic species and inorganic salts, Int. Rev. Phys. Chem., 33, 43-77, 10.1080/0144235X.2014.890786, 2014.

3. Section 2.3. Please add information of the capacity for the size resolution of the AFM.

4. Experimental (Sect. 2.3, line 10) and results: Ten minutes would be too short to reach equilibrium with the surrounding air at the given RH of 25 – 30 %. Please check and compare with the equilibrium time from Grayson et al., 2017.

Grayson, J. W., Evoy, E., Song, M., Chu, Y. X., Maclean, A., Nguyen, A., Upshur, M. A., Ebrahimi, M., Chan, C. K., Geiger, F. M., Thomson, R. J., and Bertram, A. K.: The effect of hydroxyl functional groups and molar mass on the viscosity of non-crystalline organic and organic-water particles, Atmos. Chem. Phys., 17, 8509-8524, 10.5194/acp-17-8509-2017, 2017

5. Experimental and results: If the particles undergo RH decreasing gradually from high RH (i.e. ∼100%) to ∼25-30%, would you still expect core-sell morphology at the RH? It would be worth to try additional experiments.

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