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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Hygroscopic properties of NaCl and NaNO₃ mixture particles as reacted inorganic sea-salt aerosol surrogates" *by* D. Gupta et al.

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* Response to the general comments by Anonymous Referee #1:

We thank the reviewer very much for the positive evaluation of our work and very insightful comments. We will incorporate the references of our previous works in the experimental section as pointed out by the reviewer.

* Response to minor comments by Anonymous Referee #1:

1: The change of particle size (area ratio = A/A0) in the hygroscopic curves plotted both for the humidifying and dehydration processes are with respect to the initial parti-

cle area (A0) at the start of the humidifying cycle. These measurements were based on the optical image processing (Matrox, Inspector v9.0) and the final effloresced particle sizes were not integrated with Feret's diameter from SEI-images to keep the consistency of the plot data. This was discussed in detail in our previous publication (Ahn et al., 2010).

2: The particle area ratios plotted in Figure 2(a) is with respect to the initial particle area (A0) at the start of the humidifying cycle as pointed out above. As the 2-D projected area ratio was obtained, the different A/A0 values obtained at the start of the humidifying process and at the end of the dehydration process, which would happen due to the deliquescence and efflorescence events, does not necessarily mean that the actual volume (or mass) of the particle, which should be the same, is changed on re-crystallization/solidification (Ahn et al. 2010).

The microstructures in SEI images and elemental X-ray maps (Figure 5) clearly complements the efflorescence mechanism of the NaCl-rich and NaNO3-rich and eutonic composed particles (Figure 4). NaCl homogeneously nucleates to crystallize first for all mole fractions and hence forms the core. For NaCl-rich and eutonic composed particles, during the dehydration process the NaCl from the metastable aqueous eutonic part crystallizes at the second ERH (apparently the MERH) on the already crystallized NaCl part (from first ERH). For NaNO3-rich particles, the microstructure is similar because NaCl is homogeneously crystallized in the core and NaNO3 solidifies heterogeneously around the core. We would like to point out that from SEM-EDX mapping (Figure 5) the final microstructure of effloresced NaCl-NaNO3 mixture particles of all mixing ratios show a NaCl core (through homogeneous nucleation) and NaNO3 solidified around that core. This observation is discussed in detail in section 3.5 entitled as: Spatial distribution of effloresced NaCl-NaNO3 solid particles.

Ref: Ahn et al. (2010). "Combined Use of Optical and Electron Microscopic Techniques for the Measurement of Hygroscopic Property, Chemical Composition, and Morphology of Individual Aerosol Particles." Analytical Chemistry 82(19): 7999-8009.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 33143, 2014.