Electronic Supplementary Material (ESI) for Environmental Science: Atmospheres.

SUPPLEMENTARY INFORMATION

Exploring the Hygroscopicity, Water Diffusivity, and Viscosity of Organic-Inorganic Aerosol - A Case Study on Internally-Mixed Citric Acid and Ammonium Sulfate Particles

Craig S. Sheldon[1], Jack M. Choczynski[1], Katie Morton[2], Teresa Palacios Diaz[2], Ryan D Davis[2,3], James F Davies[1]*

1. Department of Chemistry, University of California Riverside, Riverside CA 92521

2. Trinity University, Department of Chemistry, San Antonio TX 78212

3. Sandia National Laboratories, Materials Reliability Department, Albuquerque NM 87123

** Corresponding author: jfdavies@ucr.edu*

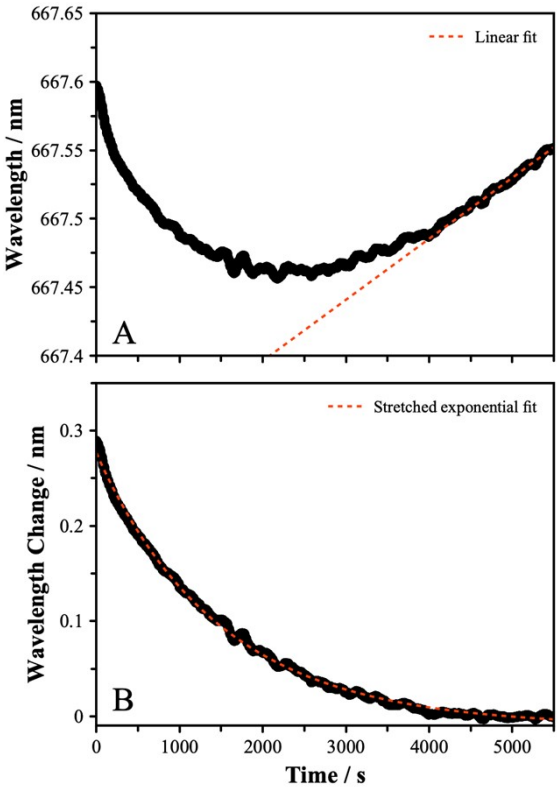

Figure S1: (A) For measurements at low RH that span extended timescales (1000's seconds), the wavelength was observed to consistently increase in the absence of external perturbations. To account for this and analyze changes associated with the step change in RH, a linear fit to the updrift was subtracted from the data, yielding the wavelength change associated with the change in water. The origin of the updraft in wavelength is unknown, but is expected to be due to the uptake of trace gas phase base compounds, such as ammonia. Due to its low magnitude, it reflects a minor change in the overall particle composition and is not further accounted for in the analysis and discussions here. (B) The corrected data was fit with a stretched exponential function to determine the halftime for the RH step.

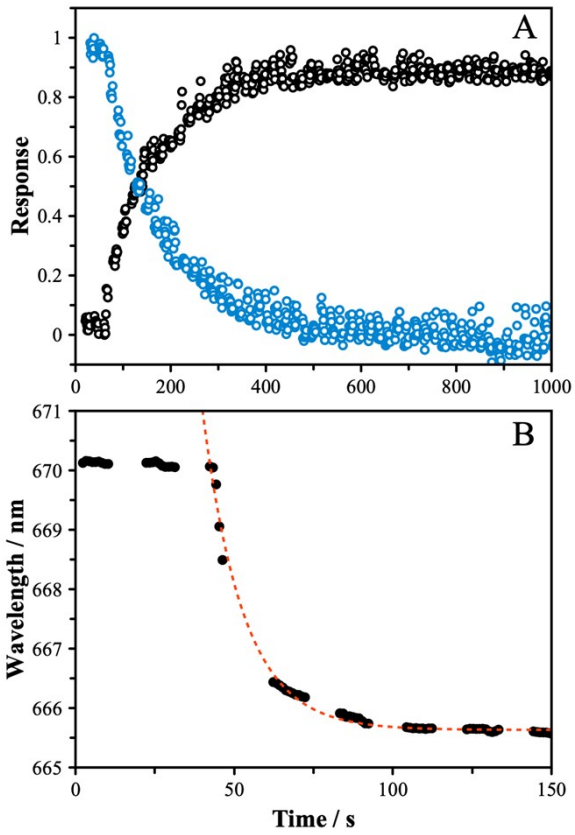

Figure S2: (A) Normalized response of a CA particle to a 1% change in RH, stepping up in black and down in blue, at 20% RH. (B) Wavelength response of LiCl particle exposed to a 1% step change – red line shows an exponential fit yielding a half-life of ~5 s for this transition.

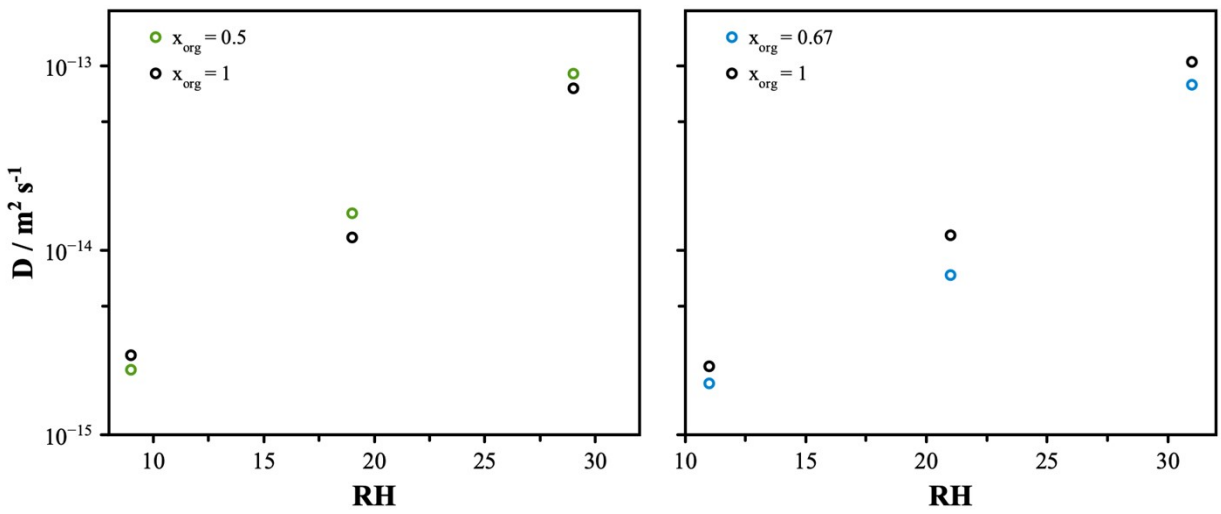

Figure S3: Direct comparisons were performed between pure CA particles and those with $^{x_{org}} =$ 0.5 and 0.67, (A) and (B) respectively. Both particles were trapped simultaneously to compare the response to the same environmental conditions. The diffusion coefficients fall within the range of values shown in Figure 1B, and these data show that the differences are small.

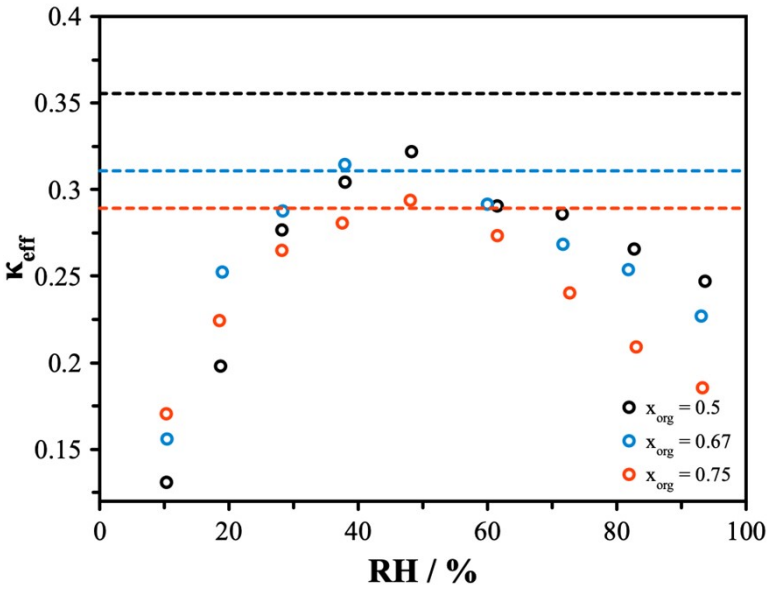

Figure S4: The effective κ parameter determined from the radial growth factors shown in Figure 2. The RH dependence arises due to the limitations of the single parameter fit across a wide range of environmental conditions. The dashed lines represent the calculated κ value based on the individual components, using $\kappa_{AS} = 0.55$ and $\kappa_{CA} = 0.23$, and a volume-additive scaling factor.

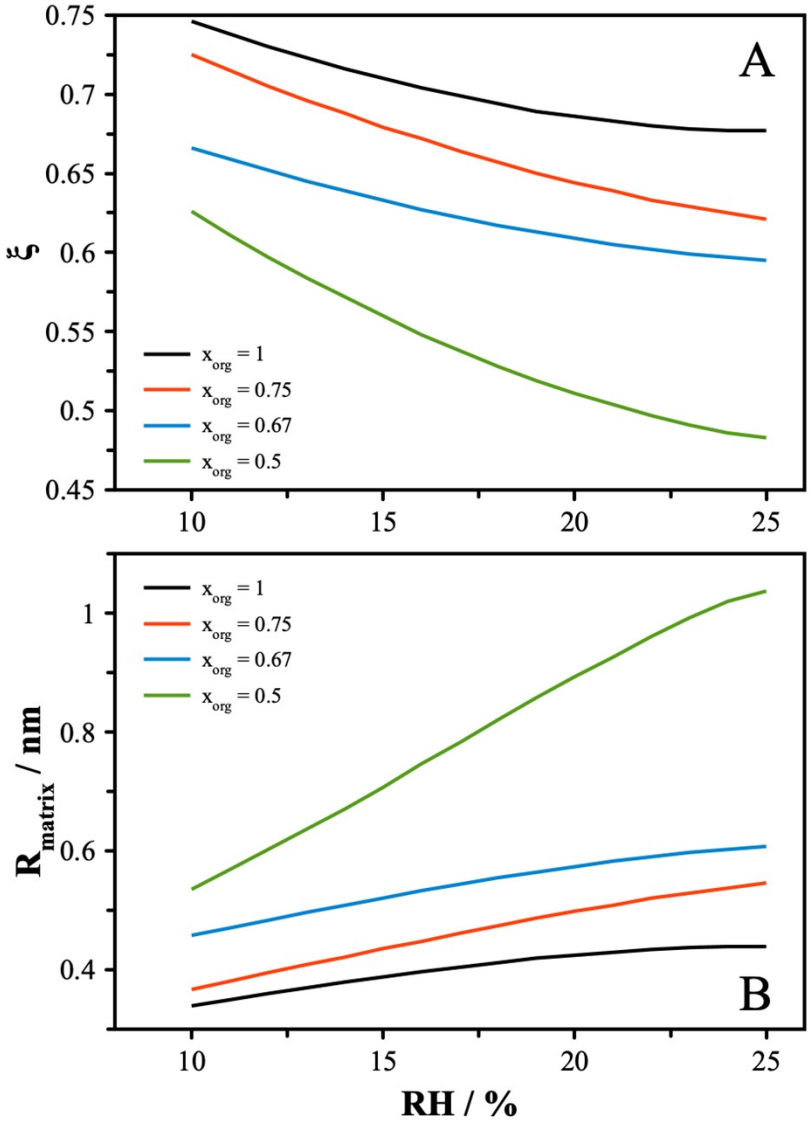

Figure S5: (A) The value of the exponential factor, ξ, varies as a function of RH to achieve agreement to the experimental observations. (B) The corresponding R_{matrix} values were determined.