



Supplement of

Hygroscopicity of organic compounds as a function of organic functionality, water solubility, molecular weight, and oxidation level

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The principle of HTDMA can be described as follow: the generated aerosol particles passed through a silica diffusion dryer and a Nafion dryer (Perma Pure, MD-700-24S-3), and were dried to $RH < 8\%$. Subsequently, the dried particles were neutralized and obtained Boltzmann charge distribution by using a Kr85 neutralizer (TSI Inc.). After charging, the monodisperse aerosols with specific diameters were selected by the first differential mobility analyzer (DMA1, Model 3081L, TSI Inc.). Afterwards, the monodisperse aerosol particles entered into a Nafion humidifier (Perma Pure, PD-100T-24MSS) with a residence time about 2.7s, and they were humidified to a given RH (10-90 %). After humidifying, there was a similar system including another DMA (DMA2, Model 3081L, TSI Inc.) and a condensation particle counter (CPC, Model 3772, TSI Inc.) to measure the number size distribution of the humidified particles. The whole experiment system was controlled by air conditioning with the room temperature of around $24\text{ }^{\circ}\text{C}$, and the internal temperature was kept at $\pm 0.5\text{K}$ around the standard value. It should be noted that, because of we just measure the mode value of GF distribution of humidified particles, the multiple charge correction was ignored (Tan et al., 2013).

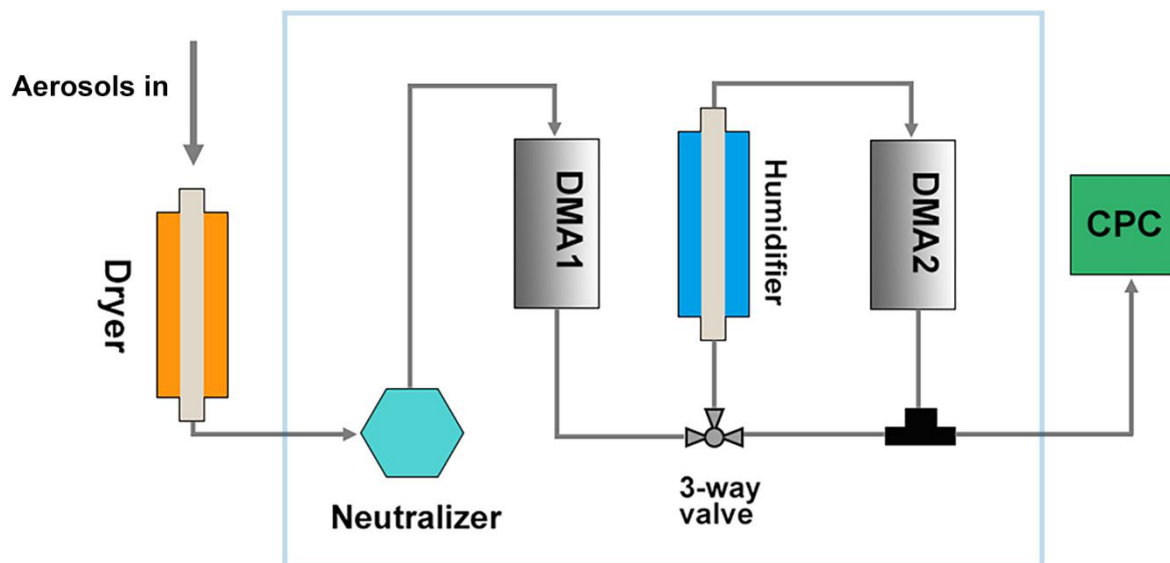


Figure S1. A schematic of the HTDMA instrument system.

To show the measured hygroscopic data is agree well with the E-AIM predictions and as well as previous studies, and the deliquescence RH is around 78 %. Therefore, our HTDMA is accurate according to the calibration result of ammonium sulfate, in addition, the measured GF at given RH are the average values of 5 times measurements, within the corresponding standard deviation less than 0.03. In our system, the accuracy of DMA2 RH was maintained to be $\pm 1\%$ and the uncertainty for the mobility diameter was $\pm 1\%$ according to PSL (Polystyrene Latex particles) calibration. Hence, for our system, ε_{RH} and ε_{Dp}/Dp are 1% and 0.01, respectively, the detailed calculation of GF uncertainty is described in section 2.

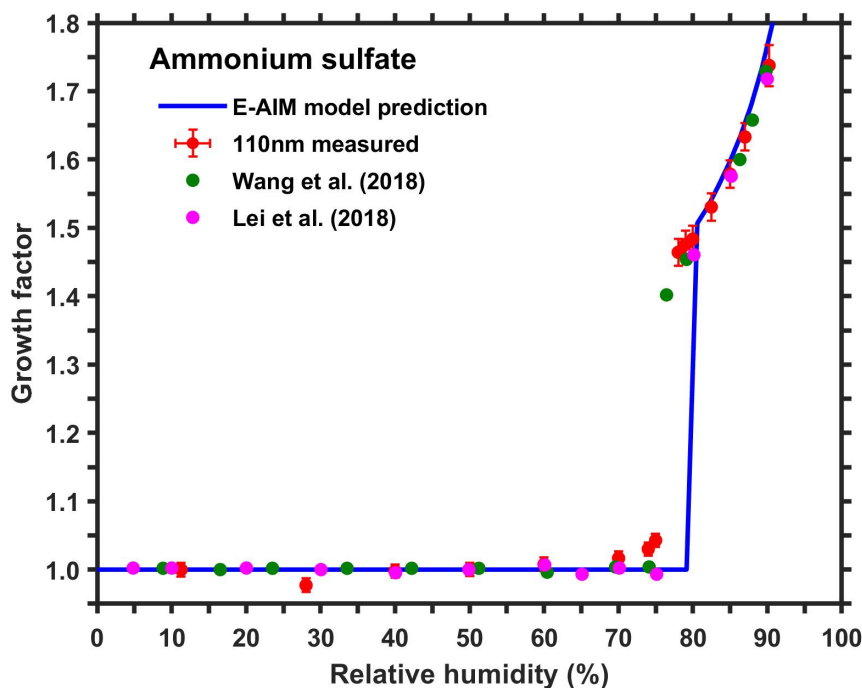
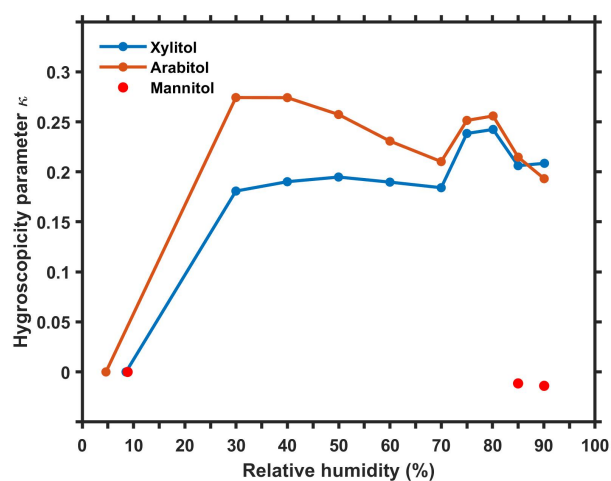
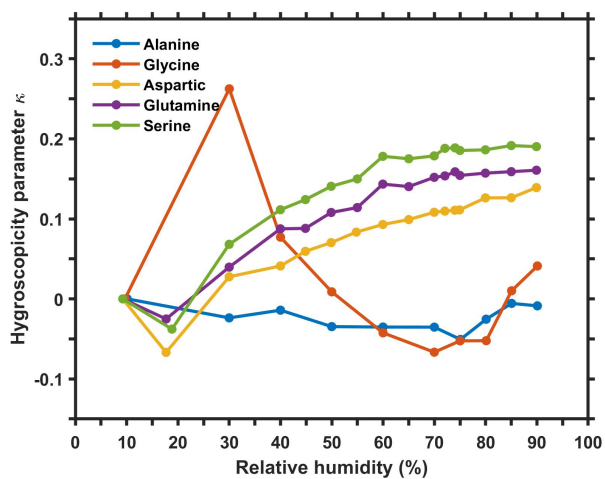
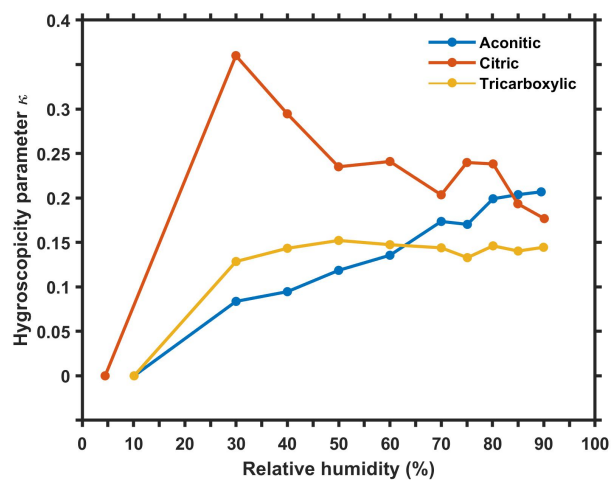
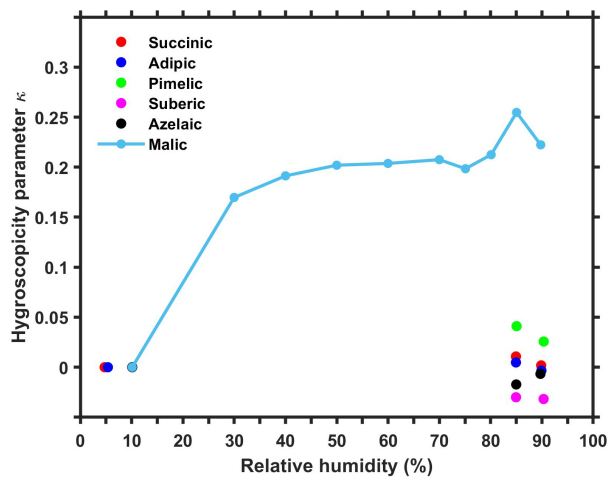


Figure S2. Hygroscopic growth factors of 110nm ammonium sulfate, and the blue line represents the E-AIM predictions. The green and magenta dots indicate the GFs of ammonium sulfate from Wang et al. (2018) and Lei et al. (2018), respectively.



30 Figure S3. Hygroscopicity parameter, κ of organic components at different RHs (initial dry diameter of 200 nm at RH < 10 %).

References

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