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Effect of mixing structure on the water uptake of mixtures of ammonium sulfate and phthalic acid particles

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Table S1. Chemical substance and their physical properties used in this work.

Chemical Compounds	Chemical Formular	Molar Mass [g mol^{-1}]	Density Solid [g cm^{-3}]	Solubility g/100 cm^3 H_2O	Solution Surface Tension [J m^{-2}]	Manufacture
Ammonium Sulfate	$(NH_4)_2SO_4$	132.140	1.770[a]	74.400(293K)	0.072	Alfa Aesar 99.95%
Phthalic Acid	$C_8H_6O_4$	166.140	1.593[b]	0.600	0.064(293K)	Alfa Aesar 99.5%

Table S2. Mass fraction of PA in the core-shell particles at dry RH (< 5 % RH)

Core Size	Coating	Mass Fraction of PA (%)
100nm AS core	10nm PA coating	23
	20nm PA coating	39
	30nm PA coating	52
	50nm PA coating	68
150nm AS core	10nm PA coating	16
	20nm PA coating	29
	30nm PA coating	40
	50nm PA coating	55
200nm AS core	10nm PA coating	12
	20nm PA coating	23
	30nm PA coating	32
	50nm PA coating	46

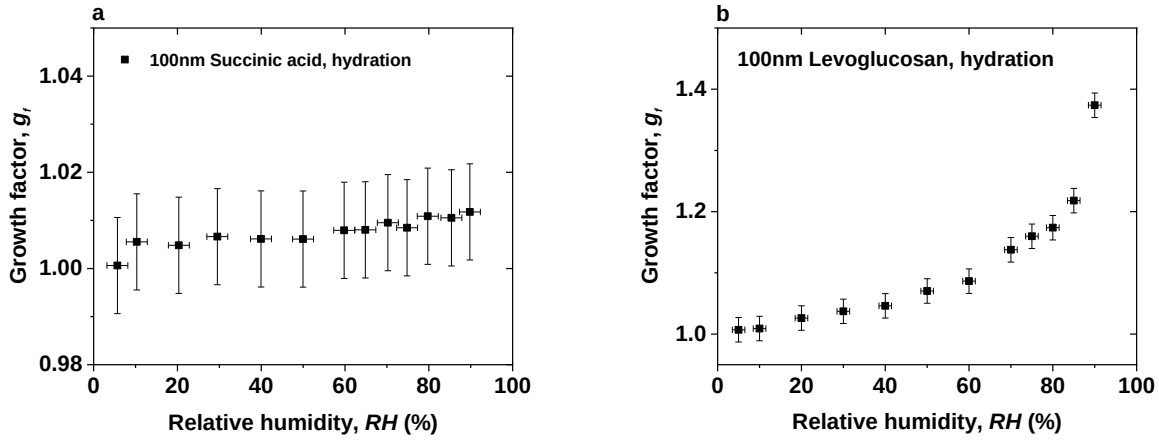

Figure S1. Hygroscopic diameter growth factor for 100 nm (dry diameter, RH < 5 %) **(a)** succinic acid and **(b)** levoglucosan aerosol particles during a hydration mode from 5 % RH to 90 % RH at 298 K (Lei et al., 2014; Jing et al., 2016).

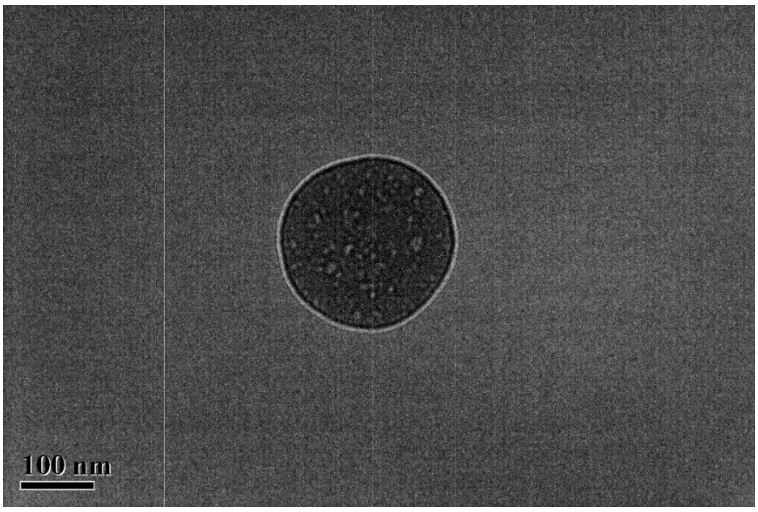

Figure S2. TEM images of well-mixed particles containing AS and 46 wt% PA at RH below 5%.

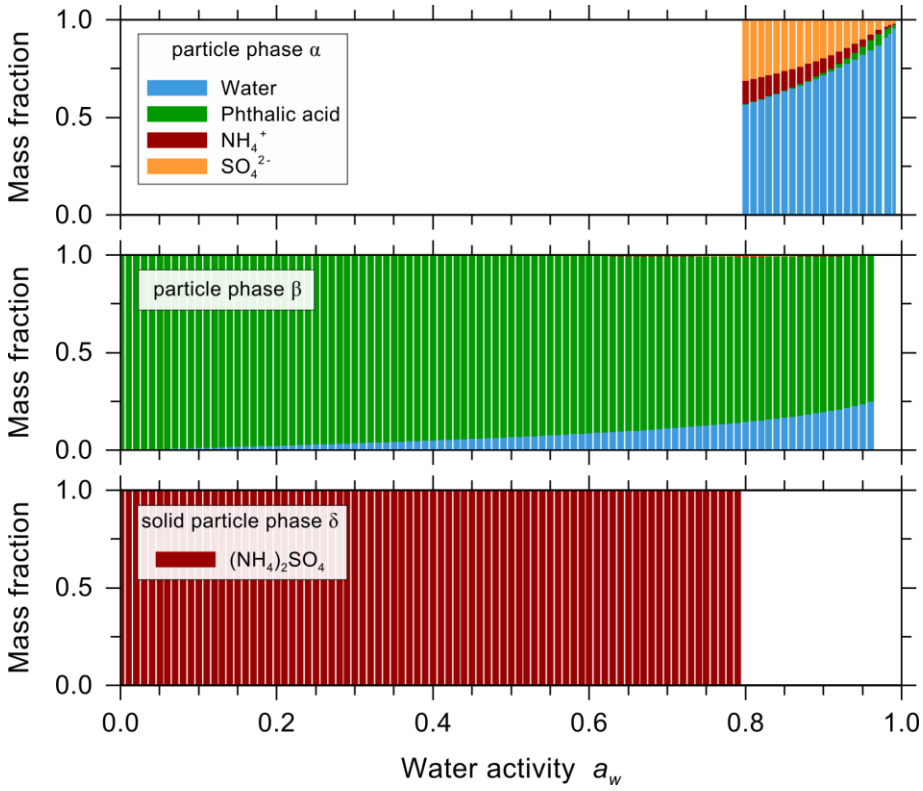

Figure S3. Predicted equilibrium state phase compositions in mass fractions for aqueous mixtures of AS and PA as a function of water activity (equilibrium RH) at 298 K. Hydration case: a solid−liquid equilibrium is predicted between a solid AS phase (δ; lowest panel) and an aqueous, PA-rich phase (β; middle panel) up to ~96% RH, followed by liquid−liquid phase separation (coexisting phases α and β) and merging into a single liquid phase at 96% RH and above.