Supplement of

Temperature and acidity dependence of secondary organic aerosol formation from α-pinene ozonolysis with a compact chamber system

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Table S1: Summary of α-pinene ozonolysis experiments under neutral seed conditions.

Exp. No.	Temp (K)	RH (%)	α-Pinene (ppbv)	O_3 (ppbv)[c]	Seed (cm^{-3})	SOA (µg m^{-3})	Yield
1			150[b]	640[b]	2.78E+04	136	0.171
2[a]			323[b]	698[b]	2.93E+04	595	0.349
3			150[b]	745[b]	2.64E+04	145	0.182
4	298	~26–27	252[b]	753[b]	3.93E+04	417	0.314
5			205[c]	>652[c]	2.66E+04	307	0.283
6			54[c]	>592[c]	4.46E+04	37	0.133
7			67.7[c]	>670[c]	3.21E+04	25	0.07
8			110[b]	748[b]	2.09E+04	167	0.277
9			244[b]	749[b]	1.96E+04	524	0.39
10			220[b]	742[b]	2.58E+04	456	0.375
11[a]	288	~32–34	307[b]	770[b]	2.46E+04	741	0.439
12			230[c]	>572[c]	2.31E+04	518	0.406
13			40[c]	>682[c]	2.42E+04	38	0.174
14			42[c]	>654[c]	2.91E+04	19	0.085
15			157[b]	723[b]	2.29E+04	271	0.301
16[a]			252[b]	710[b]	2.42E+04	608	0.424
17			118[b]	746[b]	2.30E+04	236	0.351
18	278	~45–55	165[b]	721[b]	2.27E+04	350	0.372
19			290[c]	>593[c]	1.74E+04	862	0.52
20			27[c]	>649[c]	4.26E+04	14	0.093
21			40[c]	>646[c]	2.88E+04	34	0.154

[a] Aerosols were sampled onto Teflon filters for LC-TOF-MS analysis.

[b] α-Pinene was introduced into the chamber after ozone. The presented concentration of α-pinene is the highest recorded concentration, and the presented ozone concentration is before the start of the ozonolysis reactions.

[c] α-Pinene was introduced into the chamber before ozone. The presented α-pinene concentration is before the start of the ozonolysis reactions and the ozone concentration is the highest at the start of the reactions.

Table S2: Summary of α-pinene ozonolysis experiments under acidic seed conditions.

Exp. No.	Temp (K)	RH (%)	α-Pinene (ppbv)[b]	O_3 (ppbv)[c]	Seed (cm^{-3})	SOA (μg m^{-3})	Yield
22[a]			236	>499	1.73E+04	450	0.367
23			310	>190[d]	3.02E+04	487	0.296
24			197	>476	2.73E+04	212	0.202
25			145	>722	2.32E+04	186	0.247
26	298	~26–27	243	>740	2.85E+04	356	0.282
27			145	>824	9.61E+03	200	0.263
28			314	>600	1.90E+04	441	0.267
29			55	>658	1.82E+04	55	0.192
30			51	>677	1.87E+04	24	0.092
31[a]			299	>409	2.13E+04	661	0.409
32			126	>653	1.45E+04	213	0.314
33	288	~32–34	228	>622	1.69E+04	428	0.347
34			291	>596	1.71E+04	592	0.377
35			84	>684	1.39E+04	81	0.176
36[a]			312	>373	2.18E+04	737	0.416
37			252	>595	1.80E+04	767	0.558
38	278	~45–55	143	>645	1.65E+04	345	0.433
39			200	>612	1.65E+04	525	0.472
40			52	>666	1.48E+04	70	0.237

[a] Aerosols were sampled onto Teflon filters for LC-TOF-MS analysis.
[b] Initial α-pinene concentration before the start of the reactions is presented.
[c] α-Pinene was introduced earlier than ozone. Thus, the values recorded here are the highest concentrations at the start of the α-pinene ozonolysis reactions, except Exp. No. 23.
[d] Only the ozone concentration at the end of the experiment was recorded.

Table S3: SOA compounds identified through LC-ToF-MS analysis: the m/z, chemical formula, retention time in LC column, and saturation concentration. It is presented in a separate Excel file.

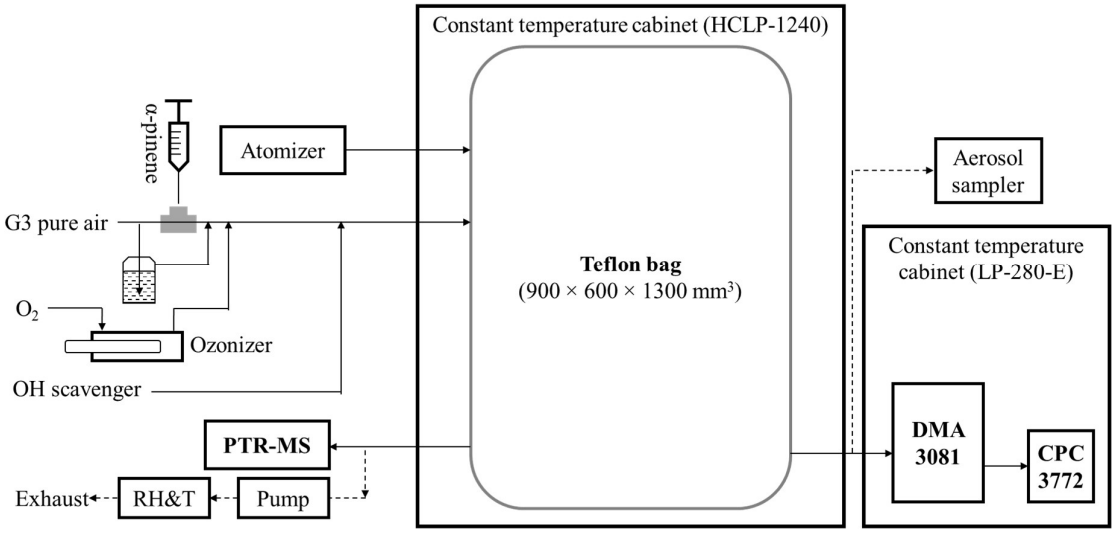


Figure S1: A schematic plot of the compact chamber system. PTR-MS, proton transfer reaction mass spectrometry; DMA, differential mobility analyser; CPC, condensation particle counter.

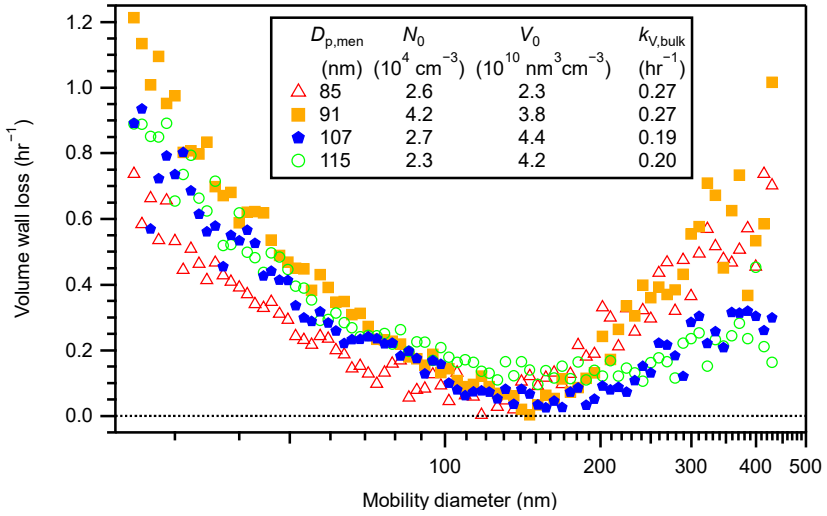


Figure S2: Size-resolved wall loss rates measured under an RH range of 17–23 %. The legend indicates the mean particle diameter during the wall loss rate measurement ($D_{p,mean}$), the initial total particle number (N_0) and volume (V_0) concentrations, and the bulk volume wall-loss constant ($k_{V,bulk}$).

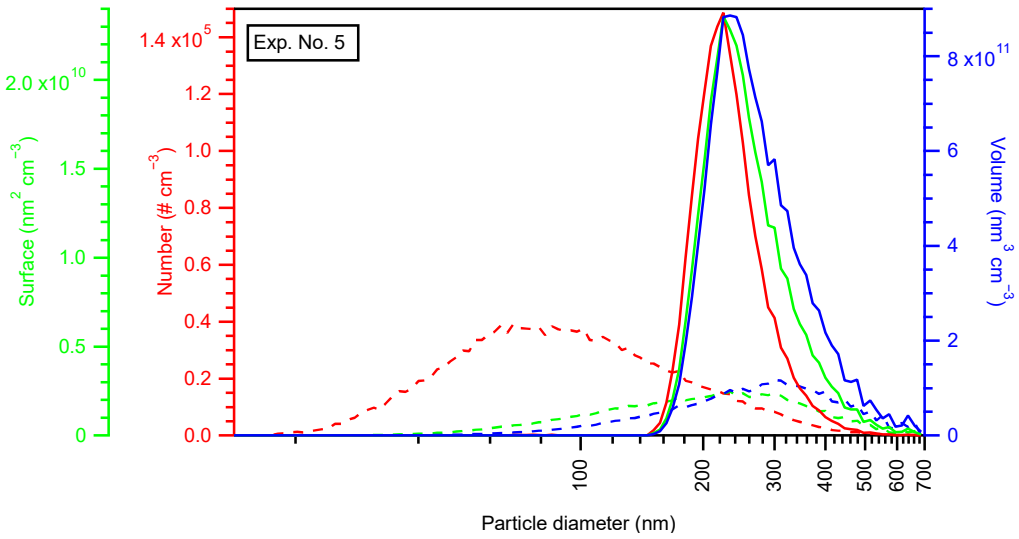


Figure S3: Number-, surface-, and volume-size distributions of aerosols before the start (i.e., seed aerosols, dashed curves) and at the end (i.e., 90 min after the start of the α-pinene ozonolysis reaction, solid curves) of a typical experimental run.

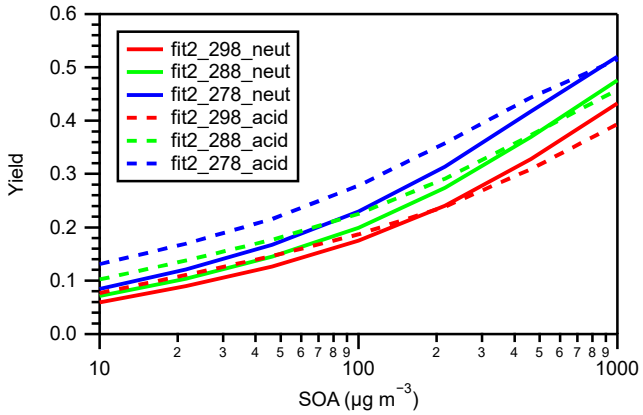
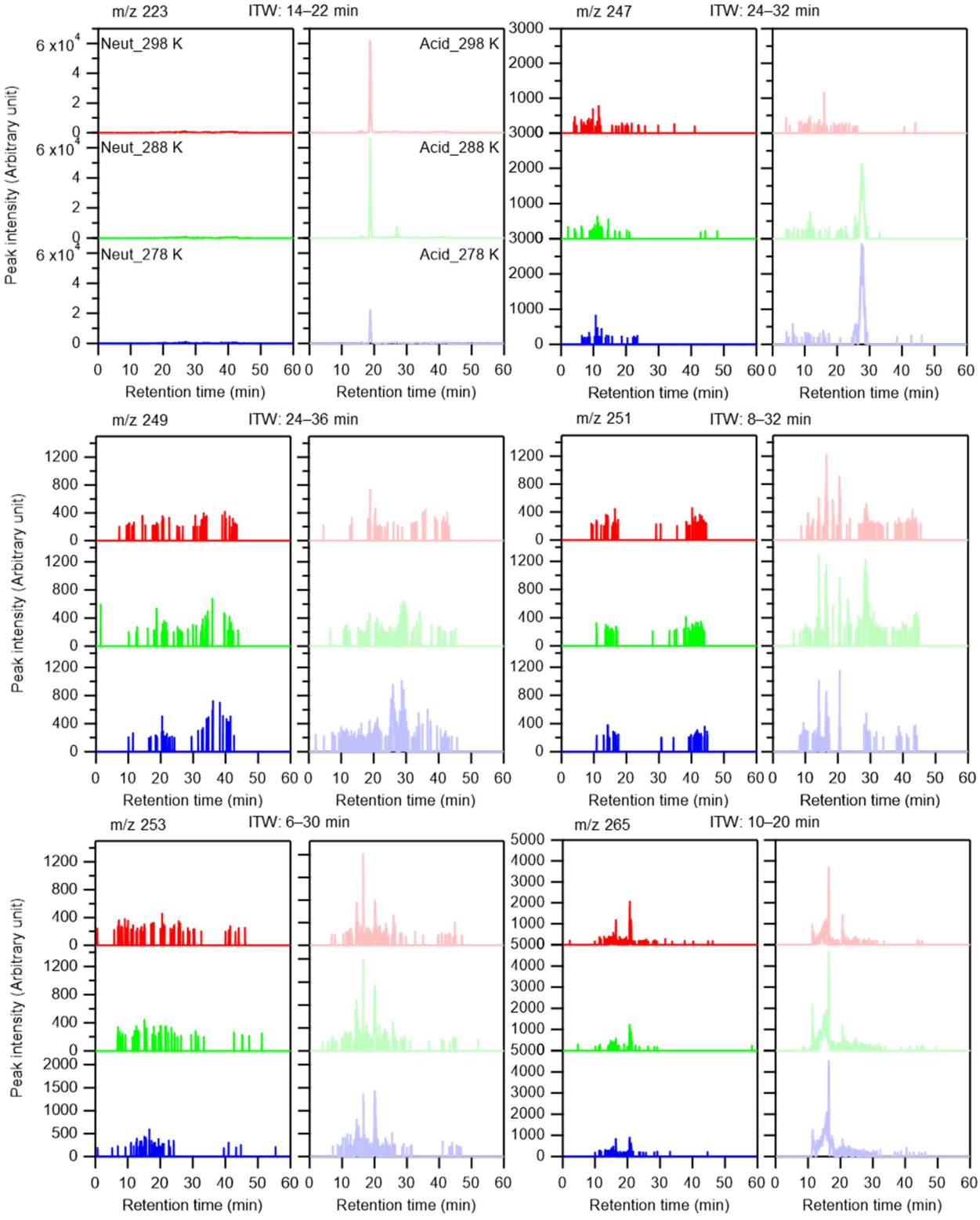


Figure S4: SOA yields versus SOA mass loadings under neutral and acidic seed conditions at different temperatures based on four-product VBS model fittings.


m/z 223
ITW: 14–22 min
Neut_298 K
Acid_298 K
Neut_288 K
Acid_288 K
Neut_278 K
Acid_278 K
Peak intensity (Arbitrary unit)
Retention time (min)
m/z 247
ITW: 24–32 min
m/z 249
ITW: 24–36 min
m/z 251
ITW: 8–32 min
m/z 253
ITW: 6–30 min
m/z 265
ITW: 10–20 min

50

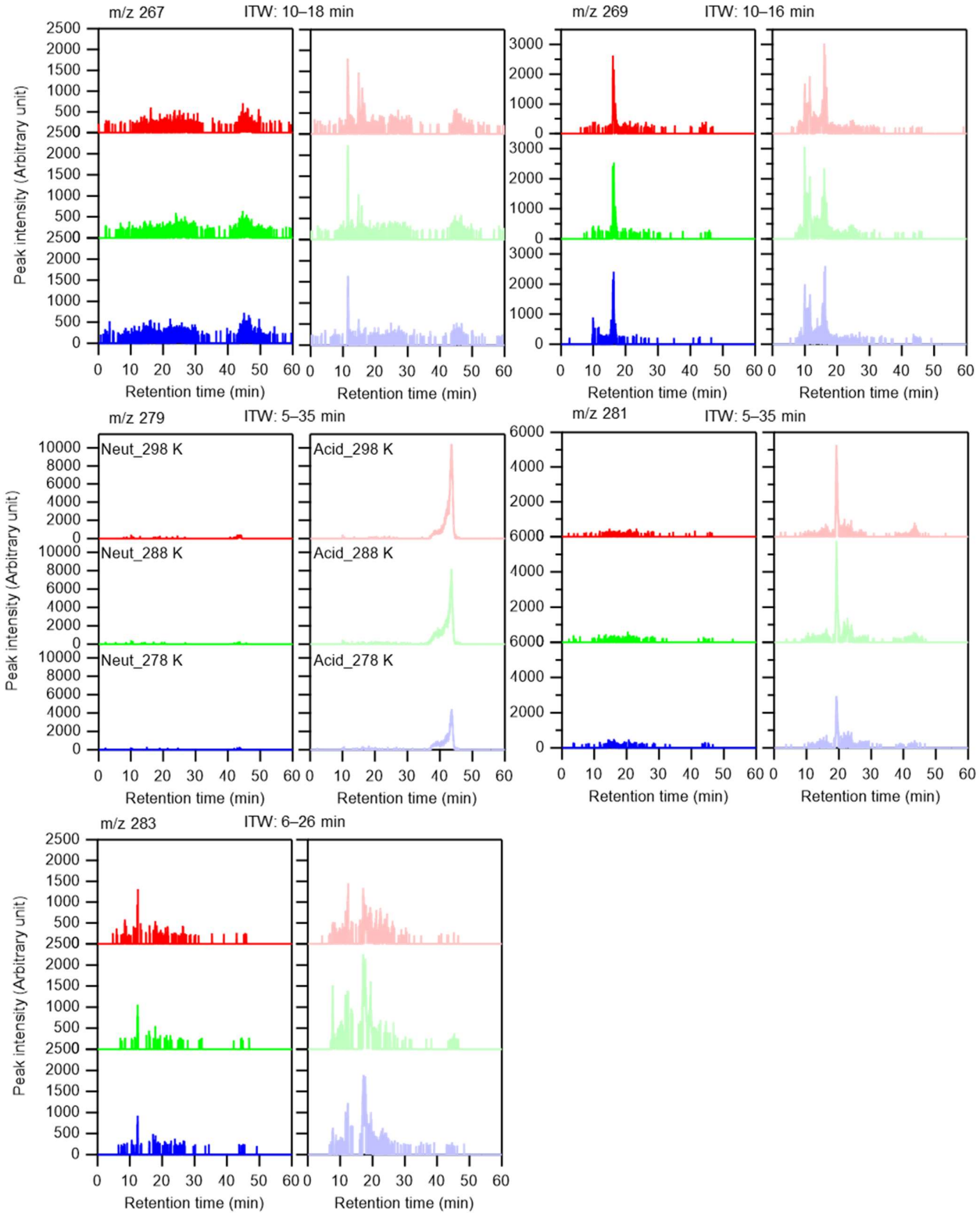


Figure S5: Extracted ion chromatograms of 11 organosulfates under different experimental conditions. The integration time window (ITW) used for the derivation of the signal intensity of each OS compound is also presented.

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