Optical Properties and Aging of Light Absorbing Secondary Organic Aerosol

Jiumeng Liu[1], Peng Lin[2], Alexander Laskin[2], Julia Laskin[3], Shawn M. Kathmann[3], Matthew Wise[4], Ryan Caylor[4], Felisha Imholt[4], Vanessa Selimovic[4‡], John E. Shilling[1,*]

[1] Atmospheric Sciences and Global Change Division, Pacific Northwest National Laboratory Richland, WA, USA.

[2] Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, WA, USA.

[3] Physical Sciences Division, Pacific Northwest National Laboratory, Richland, WA, USA.

[4] Math and Science Department, Concordia University, Portland, OR, USA.

[‡]Now at Department of Chemistry, University of Montana, Missoula, Montana 59812, USA

*Correspondence to: John E. Shilling (john.shilling@pnnl.gov)

This file includes:

Figures S1-S3

Tables S1-S2

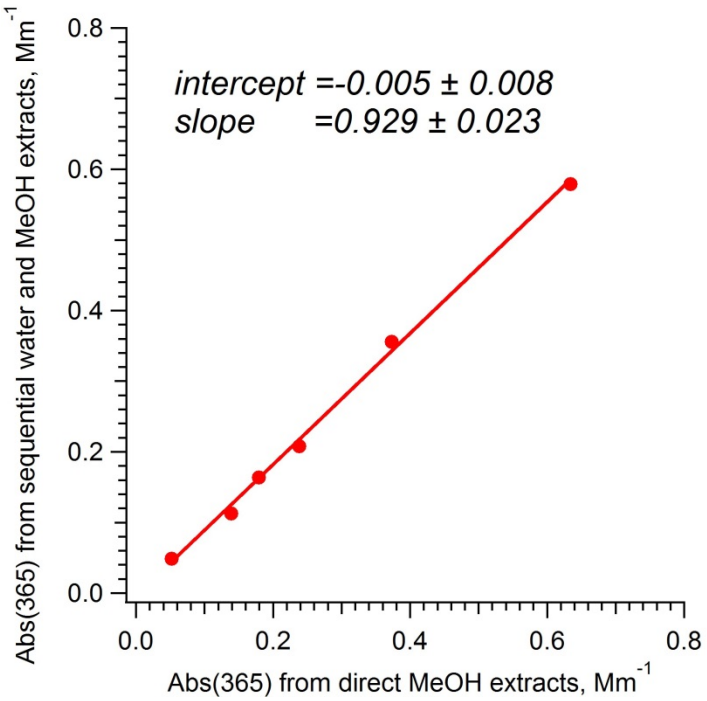

Figure S1. Brown carbon light absorption at 365 nm retrieved from the sequential extraction process compared to that from direct methanol extraction.

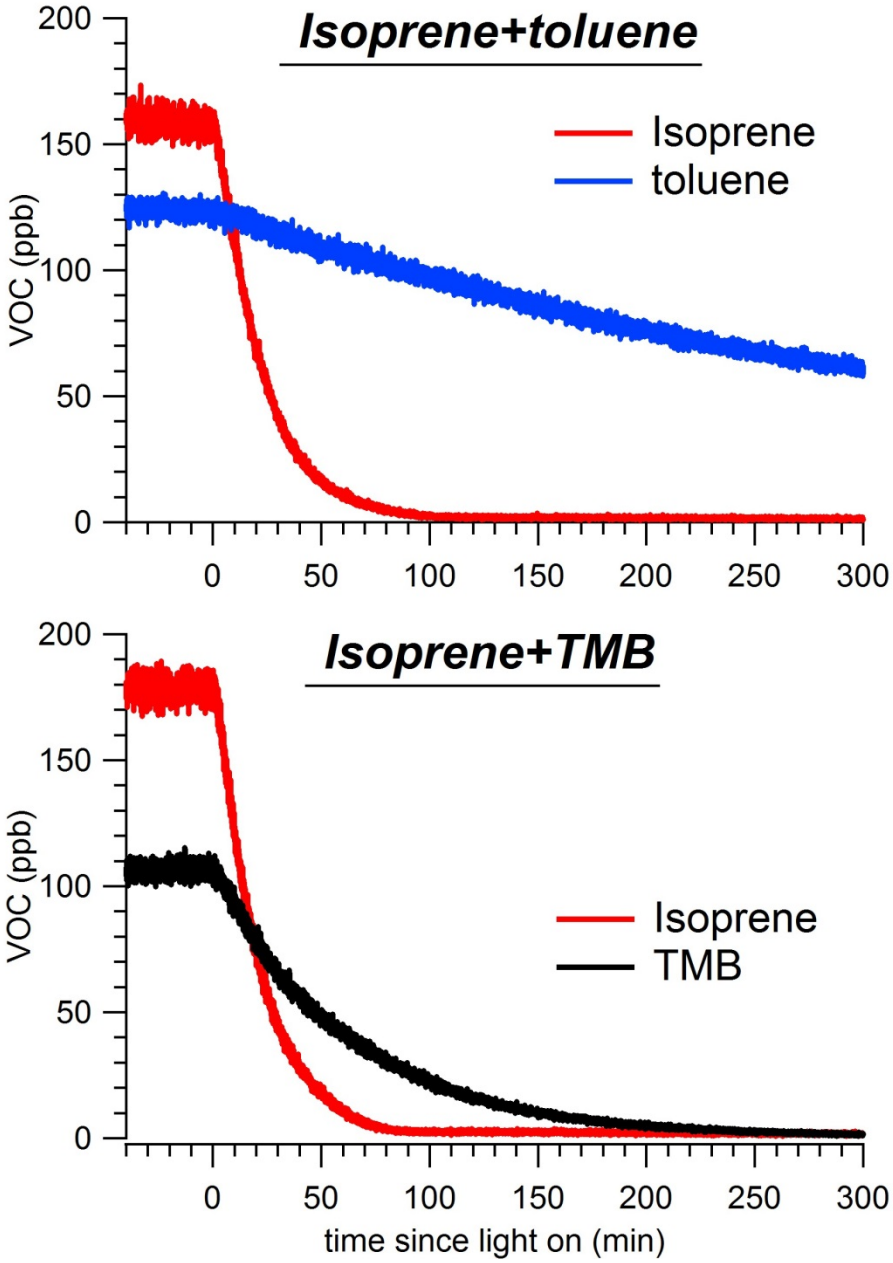

Figure S2. Evolution of VOC concentrations in mixed-precursors experiment as a function of time. Note that isoprene reacts much faster than aromatic VOCs.

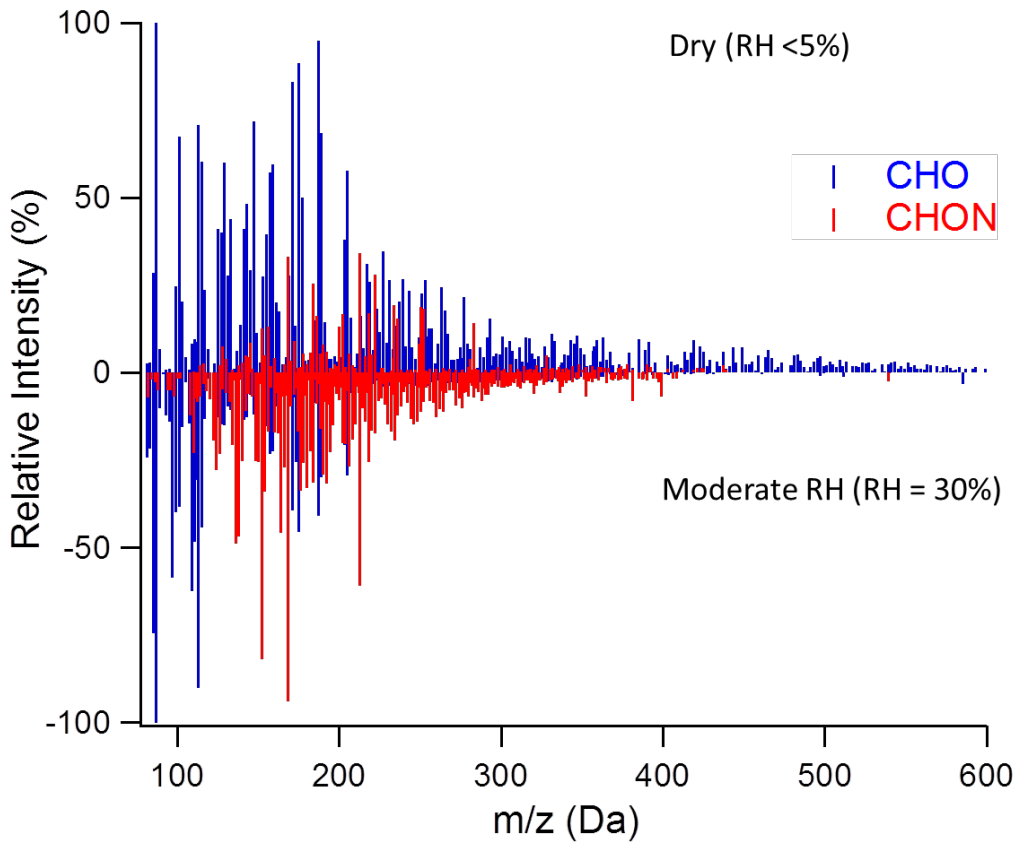

Figure S3. Negative mode nano-DESI/HRMS spectra of toluene-SOA samples generated under dry (positive intensities) and moderate RH conditions (negative intensities). Detailed methods are described in Lin et al. (2015)(Lin et al., 2015).

Table S1. Mass concentrations of aromatic- and isoprene- derived SOA in the mixed-precursor experiments, estimated using two-product model described in section 2.1.

Aromatic VOC	Reacted aromatic VOC (ppb)	Reacted isoprene (ppb)	Modeled aromatic-derived SOA ($\mu g/m^3$)	Modeled isoprene-derived SOA ($\mu g/m^3$)	Modeled total SOA ($\mu g/m^3$)	Measured total SOA ($\mu g/m^3$)
toluene	47.97	156.49	9.64	56.90	66.54	69.57
toluene	55.73	156.70	15.93	62.68	78.61	84.57
TMB	121.89	175.37	6.27	23.08	29.35	32.36

Table S2. Imaginary part of the refractive index derived from toluene SOA formed under high NO_x conditions through the 300-700 nm range.

Wavelength, nm	k_high	k_low	Wavelength, nm	k_high	k_low
300	0.0609	0.0409	580	0.0062	-0.0004
305	0.0597	0.0385	585	0.0063	-0.0005
310	0.0586	0.0364	590	0.0065	-0.0003
315	0.0577	0.0341	595	0.0063	-0.0002
320	0.0567	0.0316	600	0.0062	-0.0001
325	0.0561	0.0295	605	0.0062	-0.0002
330	0.0553	0.0281	610	0.0060	-0.0008
335	0.0543	0.0266	615	0.0057	-0.0008
340	0.0535	0.0244	620	0.0056	-0.0009
345	0.0528	0.0234	625	0.0053	-0.0012
350	0.0515	0.0226	630	0.0051	-0.0005
355	0.0503	0.0220	635	0.0047	-0.0001
360	0.0488	0.0210	640	0.0044	-0.0003
365	0.0469	0.0195	645	0.0040	-0.0005
370	0.0447	0.0182	650	0.0036	-0.0008
375	0.0425	0.0170	655	0.0035	-0.0007
380	0.0401	0.0154	660	0.0032	-0.0004
385	0.0380	0.0142	665	0.0028	0.0001
390	0.0365	0.0136	670	0.0025	0.0001
395	0.0352	0.0125	675	0.0021	0.0001
400	0.0340	0.0114	680	0.0017	-0.0001
405	0.0328	0.0110	685	0.0011	-0.0007
410	0.0317	0.0103	690	0.0007	-0.0014
415	0.0308	0.0091	695	0.0004	-0.0010
420	0.0300	0.0083	700	0.0000	0.0000
425	0.0290	0.0081			
430	0.0278	0.0078			
435	0.0266	0.0068			
440	0.0254	0.0061			
445	0.0239	0.0051			
450	0.0225	0.0045			
455	0.0213	0.0045			
460	0.0199	0.0042			
465	0.0184	0.0035			
470	0.0171	0.0028			
475	0.0159	0.0029			
480	0.0148	0.0024			
485	0.0137	0.0015			
490	0.0127	0.0014			
495	0.0121	0.0014			
500	0.0115	0.0009			
505	0.0107	0.0008			
510	0.0103	0.0009			
515	0.0099	0.0009			
520	0.0096	0.0012			
525	0.0092	0.0007			
530	0.0088	0.0004			
535	0.0084	0.0006			
540	0.0080	0.0005			
545	0.0079	0.0006			
550	0.0077	0.0005			
555	0.0075	-0.0001			
560	0.0074	-0.0006			
565	0.0072	-0.0003			
570	0.0068	-0.0001			
575	0.0065	-0.0004			

References

Lin, P., Liu, J., Shilling, J. E., Kathmann, S. M., Laskin, J., and Laskin, A.: Molecular characterization of brown carbon (BrC) chromophores in secondary organic aerosol generated from photo-oxidation of toluene, Phys Chem Chem Phys, 10.1039/C5CP02563J, 2015.