Supporting Information

Photo-degradation of atmospheric chromophores: type conversion and changes in photochemical reactivity

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Text 1. Calculation of optical characteristics of WSOM/WISOM

The mass absorption coefficient (MAE) of the extraction is calculated，Calculated formula as follows：

$$\text{MAE } (m^2 \cdot g^{-1}) = \frac{A}{C \times L} \quad (1)$$

In (1), A is the absorption of the extraction at the wavelength of 365 nm, *C* is the detected concentration of the extraction (μg/mL), and L is the path length of light (according to the cuvette, it is determined as 1 cm).

Absorption Ȧngström exponent is calculated (AAE) using the following calculation:

$$\text{AAE} = \frac{-\ln(A(\lambda_1)/A(\lambda_2))}{\ln(\lambda_1/\lambda_2)} \quad (2)$$

In (2), λ_1 and λ_2 are the selected wavelengths in the wavelength range with obvious wavelength-dependent characteristics.

E_2/E_3 is calculated using the following relation:

$$E_2/E_3 = MAE_{250}/MAE_{365} \quad (3)$$

Table S1. Details of primary organic aerosol (POA) and ambient particulate matter (ambient PM).

POA			Ambient PM			
Sample ID	**Sample category**	**Combustion quantity/g**	**Sample ID**	**Sampling Date**	**Sampling Season**	**Illustration**
1	Wheat Straw	2.4860	9	2017-4-18	Spring	Sand Storm
2		2.4869	10	2017-4-19		
3	Corn Straw	2.4865	11	2017-1-3	Winter	Heavy pollution
4		2.4863	12	2019-1-4		
5	Rice Straw	2.4873	13	2017-7-3	Summer	Good Air Quality
6		2.4870	14	2017-7-4		
7	Wood	5.0364	15	2017-11-5	Autumn	Slight pollution
8		5.0326	16	2019-11-6		

Table S2. OC concentration of samples for optical analysis.

POA			Ambient PM		
Sample ID	c_{WSOC}/**ppm**	c_{WISOC}/**ppm**	**Sample ID**	c_{WSOC}/**ppm**	c_{WISOC}/**ppm**
1-0h	2.99	6.86	9-0h	59.12	7.42
1-2h	2.91	2.87	9-2h	65.85	5.48
1-6h	3.13	2.52	9-6h	67.39	8.30
1-12h	3.51	2.67	9-12h	55.90	6.36
1-24h	3.76	2.68	9-24h	54.41	7.20
1-3d	3.02	2.15	9-3d	76.46	4.41
1-7d	3.00	2.24	9-7d	63.24	2.95
2-0h	3.60	2.96	10-0h	52.97	3.52
2-2h	4.19	2.85	10-2h	54.92	7.25
2-6h	4.00	3.22	10-6h	61.99	7.12
2-12h	3.60	0.73	10-12h	53.09	4.94
2-24h	4.13	3.78	10-24h	48.29	4.68
2-3d	3.38	4.46	10-3d	48.15	4.01
2-7d	3.31	2.64	10-7d	53.70	3.82
3-0h	5.86	3.15	11-0h	6.62	2.79
3-2h	6.13	3.31	11-2h	4.99	4.61
3-6h	6.31	5.26	11-6h	4.10	4.22
3-12h	6.20	2.51	11-12h	5.01	1.67
3-24h	5.19	5.44	11-24h	5.59	2.84
3-3d	5.02	4.09	11-3d	3.66	0.47
3-7d	4.70	4.90	11-7d	5.34	1.08
4-0h	4.22	2.40	12-0h	5.65	3.62
4-2h	4.40	2.90	12-2h	3.75	3.81
4-6h	4.02	2.90	12-6h	7.15	4.38
4-12h	3.15	5.38	12-12h	4.98	3.17
4-24h	3.94	2.62	12-24h	4.54	2.92
4-3d	3.22	2.98	12-3d	4.03	1.42
4-7d	3.29	2.30	12-7d	5.84	1.45
5-0h	5.02	2.24	13-0h	59.68	2.90
5-2h	4.74	3.82	13-2h	57.95	3.71
5-6h	5.26	4.02	13-6h	50.79	5.19
5-12h	5.46	3.94	13-12h	52.57	3.24
5-24h	5.21	4.13	13-24h	54.15	1.34
5-3d	4.72	4.85	13-3d	55.65	<LOD
5-7d	3.67	3.53	13-7d	55.99	<LOD
6-0h	5.23	2.46	14-0h	58.12	1.86
6-2h	5.52	2.58	14-2h	47.04	4.06
6-6h	4.49	4.50	14-6h	48.95	2.13
6-12h	4.28	3.72	14-12h	49.47	2.80
6-24h	4.23	3.76	14-24h	39.93	3.70
6-3d	4.01	4.14	14-3d	29.66	0.63
6-7d	3.64	3.42	14-7d	49.12	0.59
7-0h	9.66	3.59	15-0h	42.22	2.67
7-2h	6.75	3.88	15-2h	32.35	---
7-6h	8.24	4.23	15-6h	26.49	4.96

Table S2 (continued)

POA			Ambient PM		
Sample ID	**c_{WSOC}/ppm**	**c_{WISOC}/ppm**	**Sample ID**	**c_{WSOC}/ppm**	**c_{WISOC}/ppm**
7-12h	9.33	4.26	15-12h	32.87	1.62
7-24h	7.62	4.06	15-24h	26.60	2.60
7-3d	7.23	3.70	15-3d	26.04	---
7-7d	6.37	5.21	15-7d	33.67	3.06
8-0h	9.43	4.02	16-0h	38.66	0.93
8-2h	9.34	2.24	162h	27.01	3.07
8-6h	9.34	4.47	16-6h	29.22	2.56
8-12h	9.13	4.30	16-12h	31.84	1.24
8-24h	8.51	4.41	16-24h	44.70	1.19
8-3d	6.90	5.54	16-3d	27.32	0.27
8-7d	7.09	4.83	16-7d	50.43	1.05

Table S3. Concentration of water-soluble organic carbon (WSOC) exaction for triplet state formation experiment.

POA		Ambient PM	
Sample ID	***c*WSOC/ppm**	**Sample ID**	***c*WSOC/ppm**
1-0h	14.98	9-0h	14.78
1-7d	15.01	9-7d	15.82
2-0h	14.40	10-0h	13.25
2-7d	13.24	10-7d	13.43
3-0h	16.73	11-0h	16.56
3-7d	13.44	11-7d	13.35
4-0h	16.89	12-0h	14.14
4-7d	13.15	12-7d	14.60
5-0h	16.75	13-0h	14.92
5-7d	14.70	13-7d	14.00
6-0h	14.95	14-0h	14.53
6-7d	14.57	14-7d	12.29
7-0h	19.33	15-0h	10.56
7-7d	15.92	15-7d	8.42
8-0h	18.87	16-0h	9.67
8-7d	14.18	16-7d	12.61

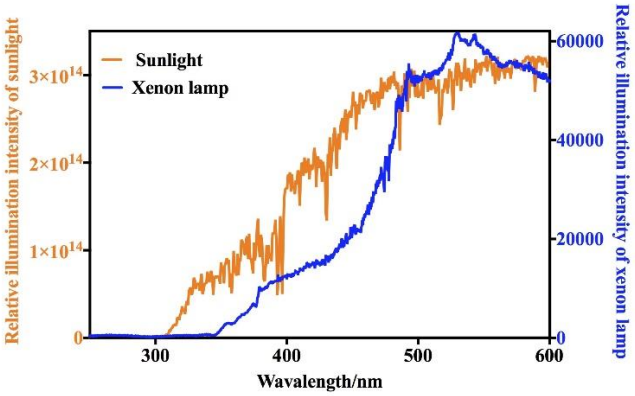

Figure S1. Wavelength spectrum of Xenon lamp. Relative irradiance data of xenon lamp is from perfect light Inc. Relative irradiance data of sunlight is from *The Tropospheric Visible Ultra-Violet (TUV) model web page.* Input parameters for the TUV model were: Longitude: E108°58′34.58″, Latitude: N34°22′35.07″, measurement altitude: 0.02 km, surface albedo: 0.1, aerosol optical depth: 0.235, cloud optical depth: 0.00.

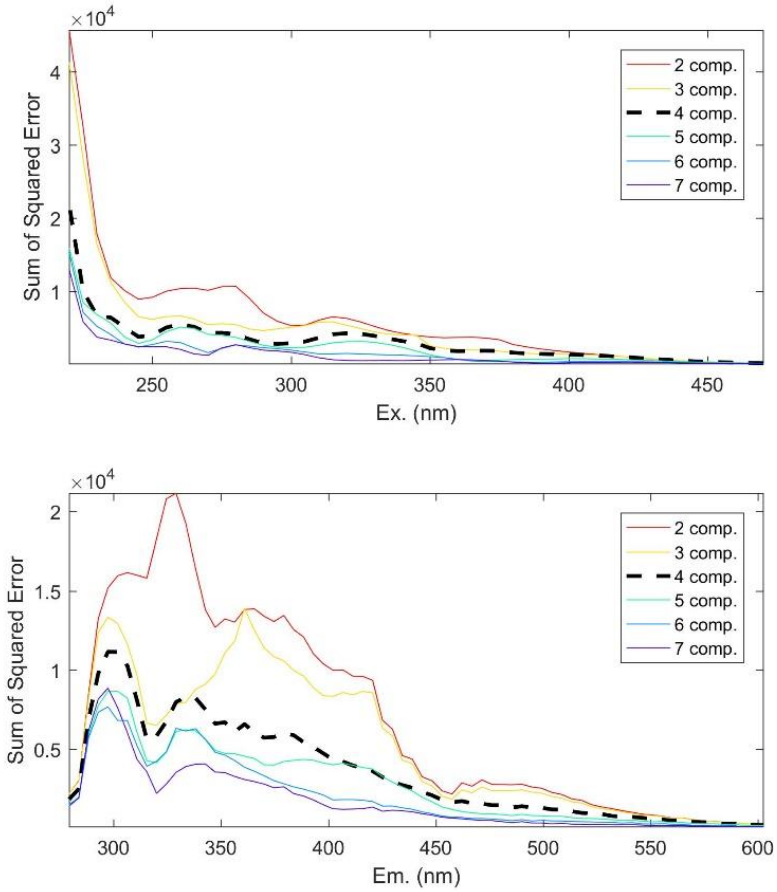

Figure S2. Analysis error of PARAFAC model.

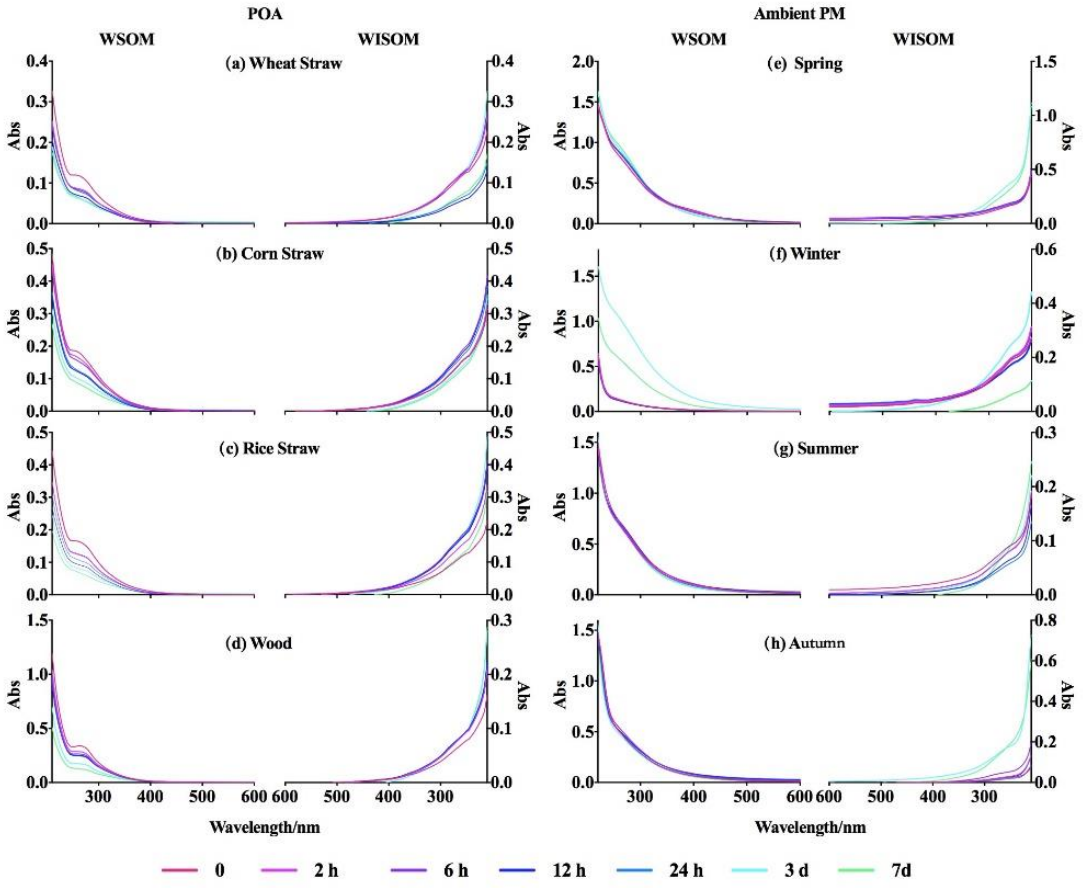

Figure S3. Absorption spectra of POA and ambient PM during the photo-aging process.

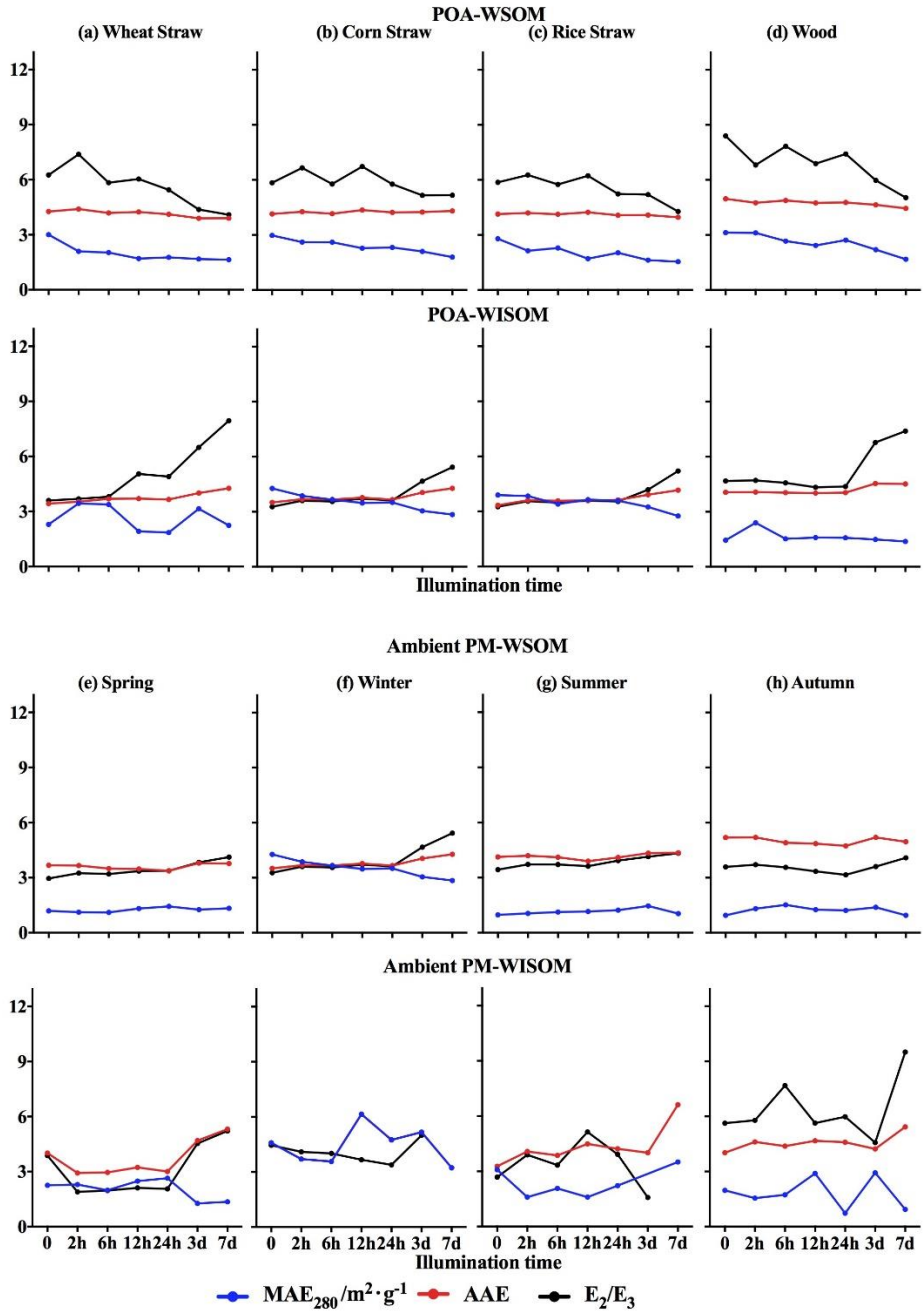

Figure S4. Optical characteristics of E_2/E_3, AAE and MAE of POA and ambient PM.

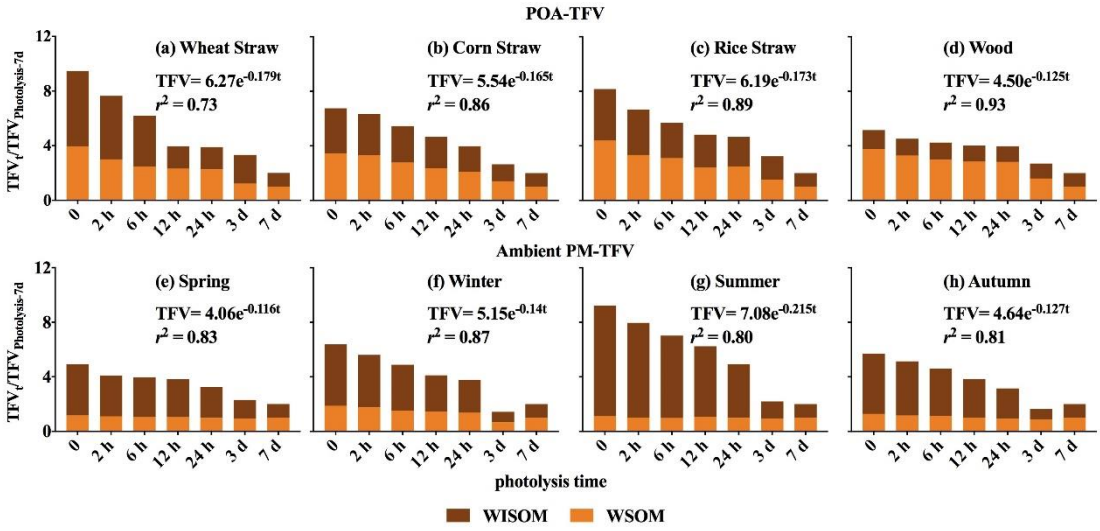

Figure S5. Characteristic of fluorescence volume attenuation in POA and ambient PM samples during the photo-aging process.

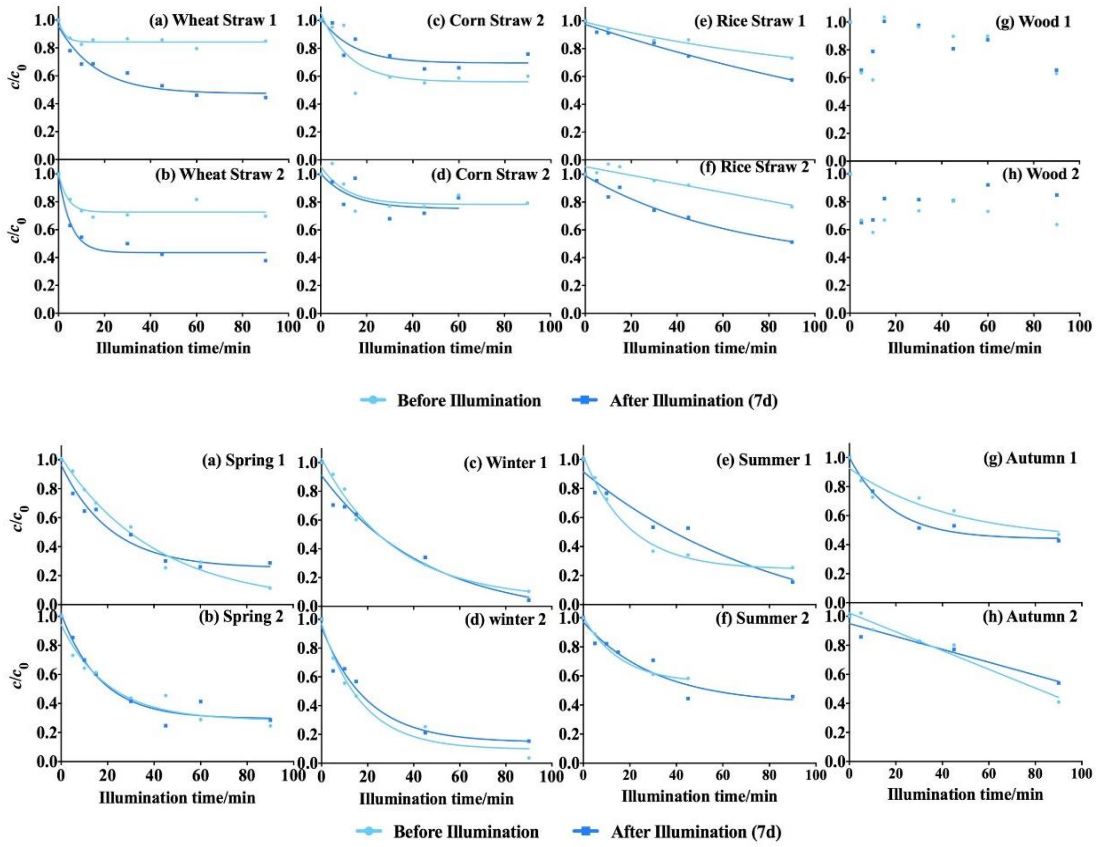

Figure S6. Formation characteristic of triplet state of POA and ambient PM samples.

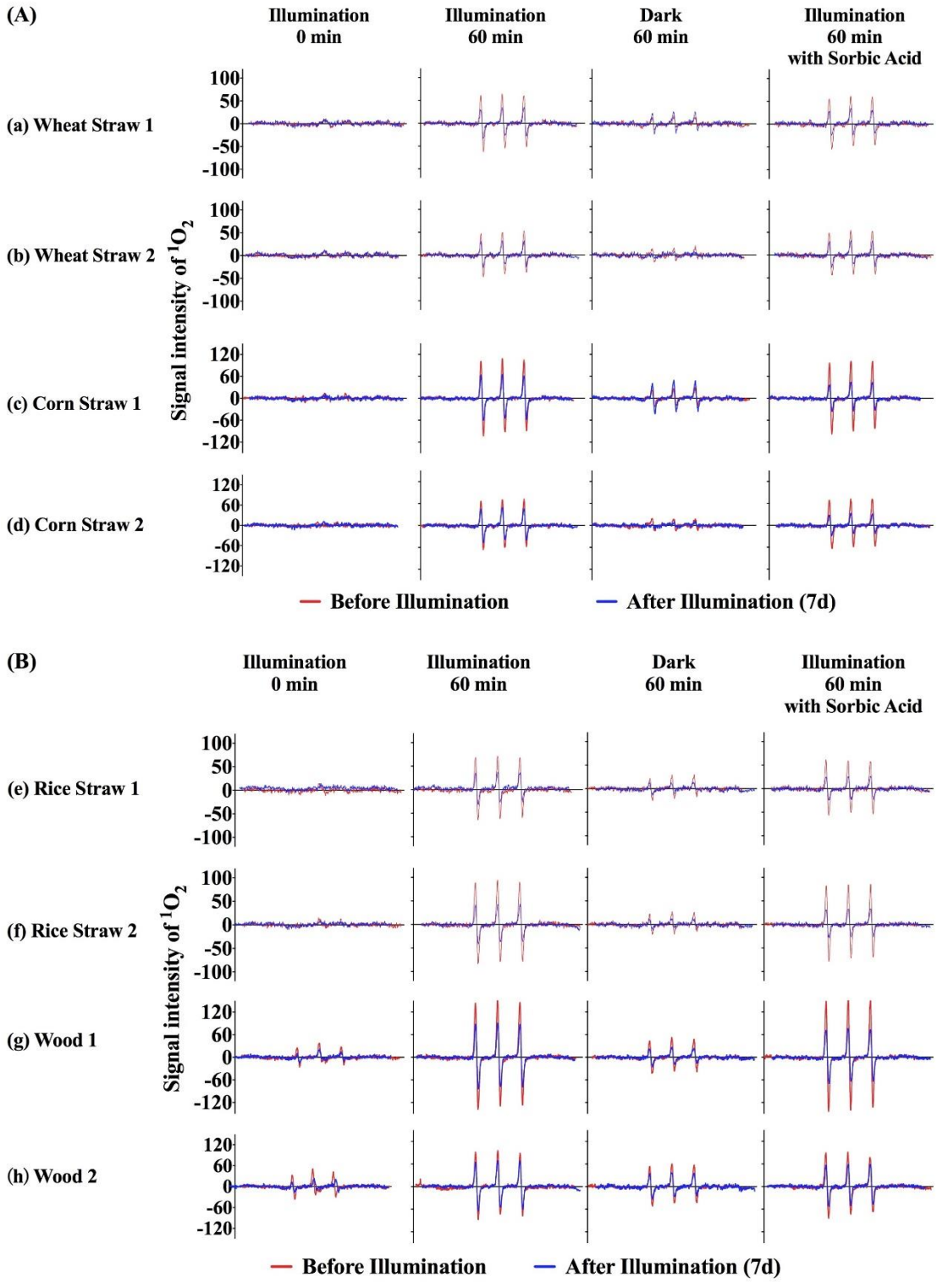

Figure S7. Characteristic of ^{3}CDOM* formation of POA driving $^1O_2$.

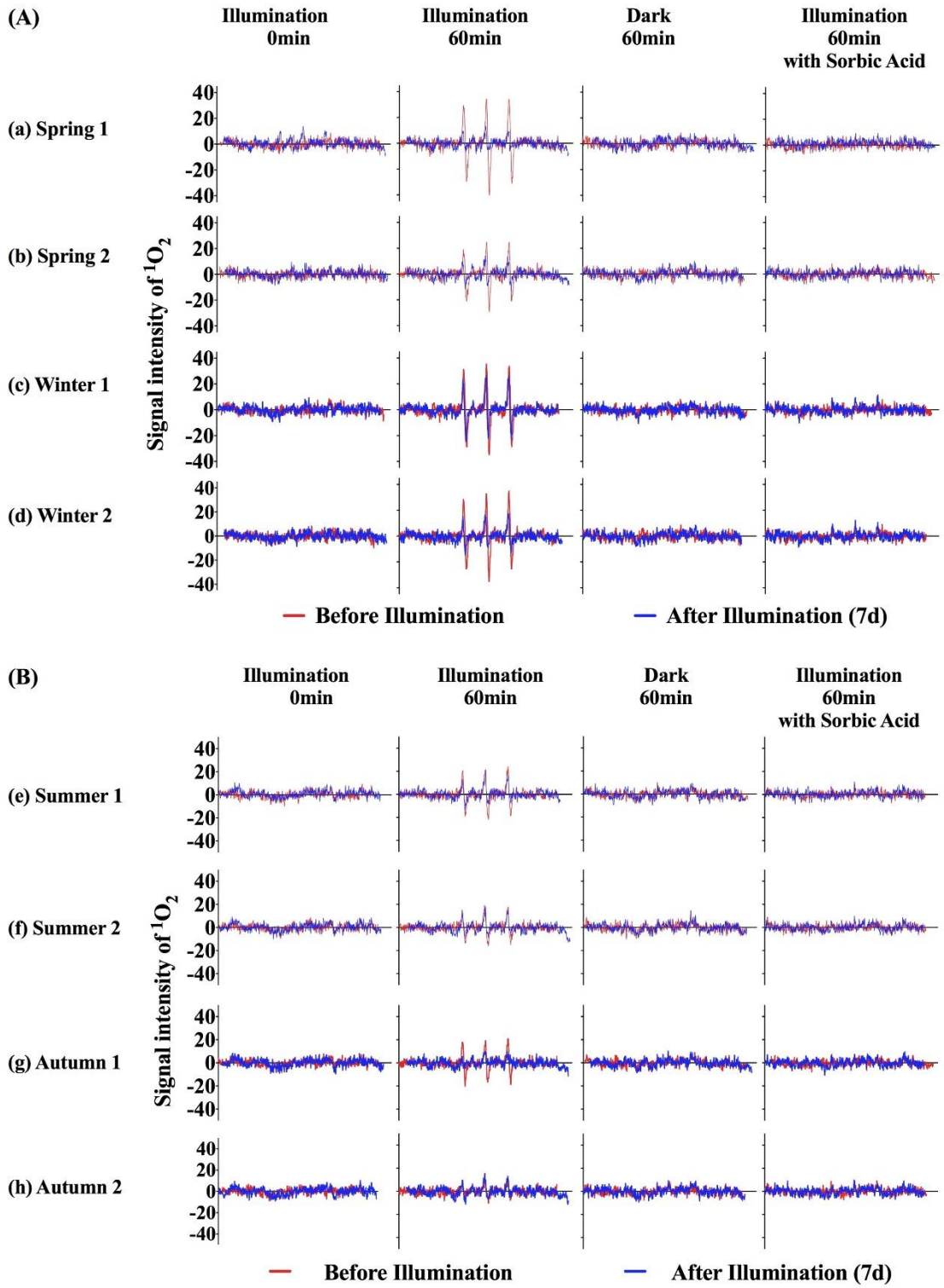

Figure S8. Characteristic of ^{3}CDOM* formation of ambient PM driving $^1O_2$.