Electronic Supplementary Material (ESI) for Environmental Science: Atmospheres.

Supplementary information for: Photoreaction of Biomass Burning Brown Carbon Aerosol Particles

Carolyn Liu-Kang[a], Peter J. Gallimore[b], Tengyu Liu[c], Jonathan P.D. Abbatt[a]

[a] Department of Chemistry, University of Toronto, 80 St. George Street, M5S 3H6, Toronto, ON, Canada

[b] Department of Earth and Environmental Sciences, University of Manchester, Manchester, M13 9PS, UK

[c] Joint International Research Laboratory of Atmospheric and Earth System Sciences, School of Atmospheric Sciences, Nanjing University, Nanjing, 210023, China

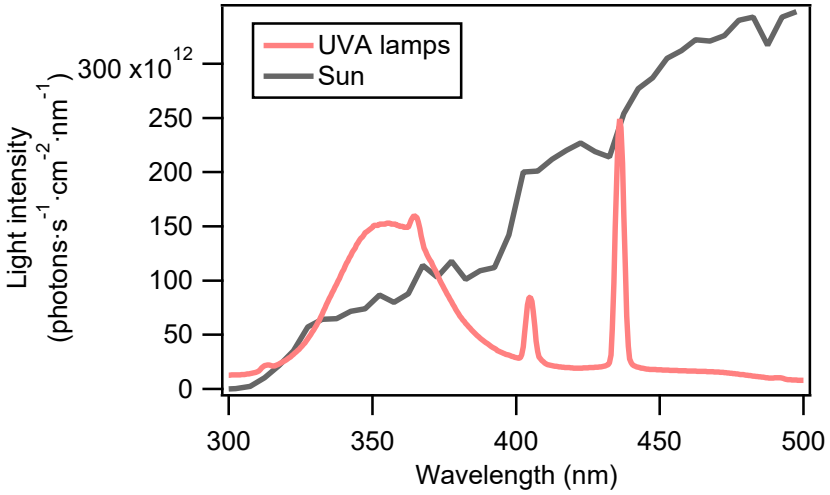

Figure S1. Light intensity in the chamber from the UVA lamps used in the photoreaction experiments as well as the sun's actinic flux, expressed in photon flux. The light intensity from the sun was obtained via https://www.acom.ucar.edu/Models/TUV/Interactive_TUV/ on May 27, 2021 with the following parameters: 50 wavelength increments from 300-500 nm, 300 Dobson units of overhead ozone, 0.1 surface albedo and 0 km altitude. The light intensity from the UVA lamps was determined by multiplying the measured irradiance by four, as the flat collector does not take into account the presence of lamps on four chamber walls.

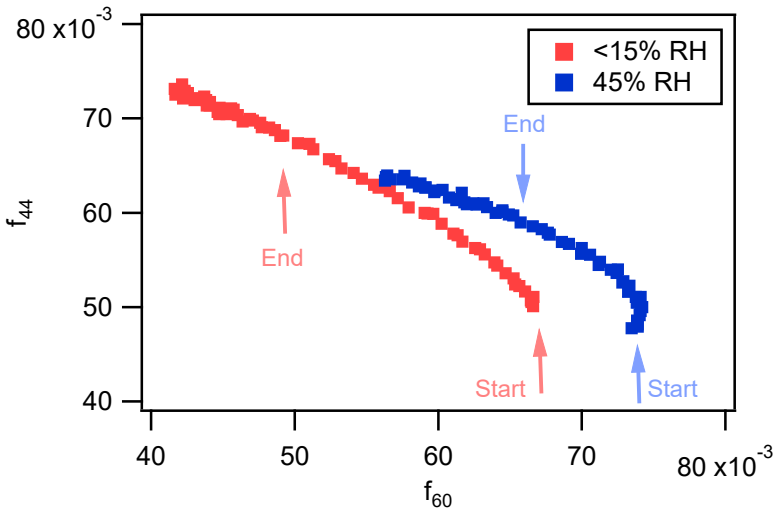

Figure S2. Changes in f_{44} vs f_{60} fractions from high-resolution AMS measurements during a photoreaction experiment of BrC for both dry and 45% RH conditions. The black arrow indicates the direction of the signal changes as aging occurs. The colored arrows indicate the beginning and end of light exposure.

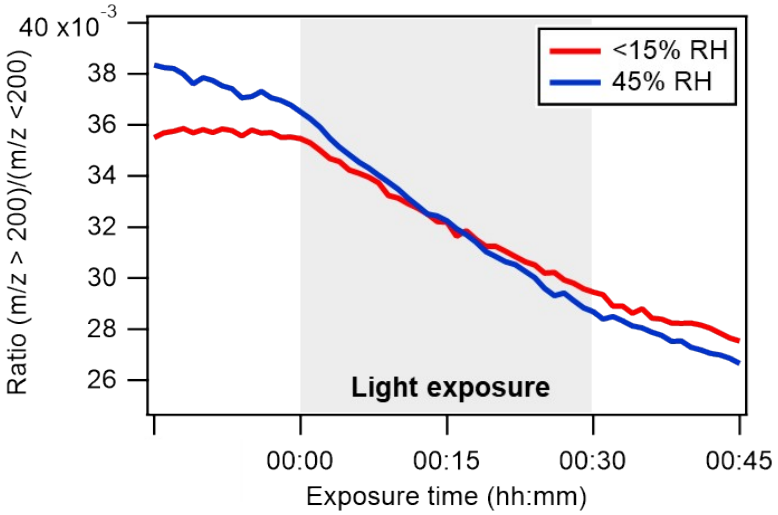

Figure S3. Ratio of AMS signal intensities for ions corresponding to m/z > 200 relative to the signals with m/z < 200, obtained by averaging signals obtained respectively above and below 200 m/z. The data is shown for both dry conditions (red) and 45% RH (blue).

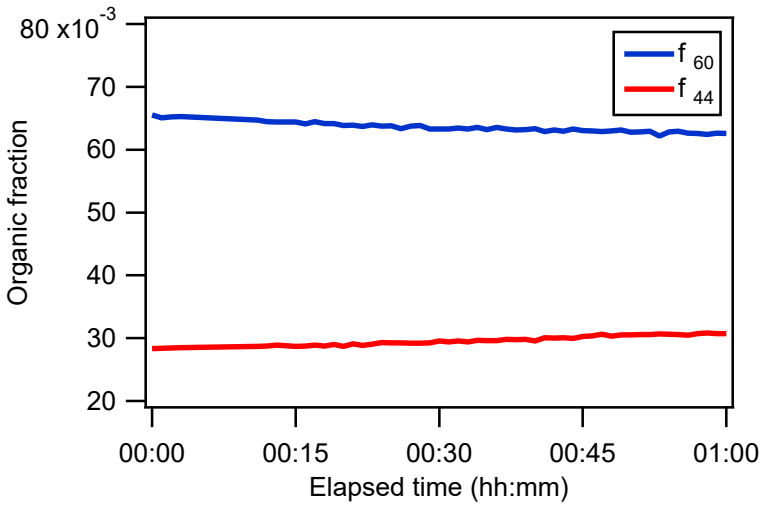

Figure S4. Changes in f_{44} vs f_{60} fractions from the AMS during a control experiment where wood smoke was injected into the chamber without light exposure.

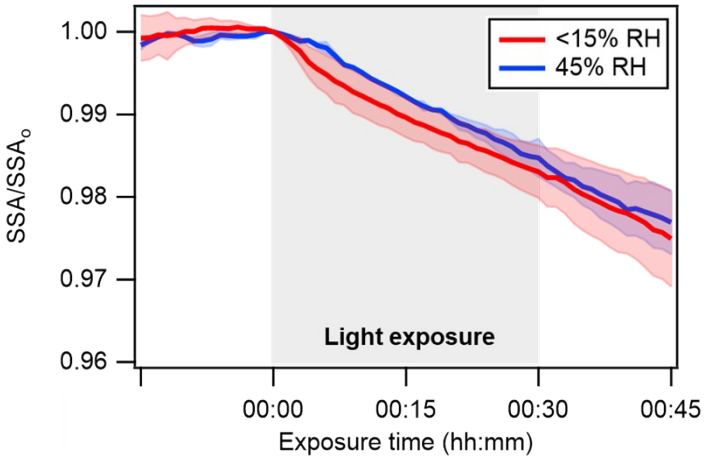

Figure S5. Changes in normalized SSA at 405 nm for both dry (red – 4 replicates) and 45% RH (blue – 2 replicates) conditions. The SSA is represented as the ratio of experimental SSA over the SSA at exposure time = 0, in order to directly compare different experiments. The shaded regions represent the standard deviation of the averaged SSA data.

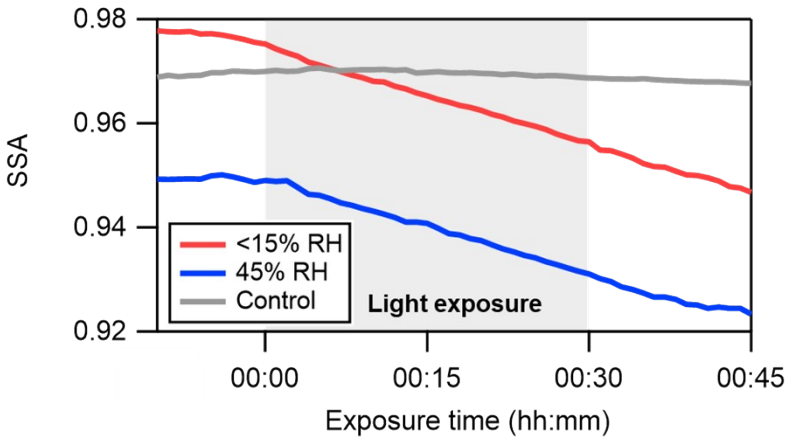

Figure S6. Evolution in SSA for three example experiments each at different conditions: <15% RH (red), 45% RH (blue), wood smoke control (grey).

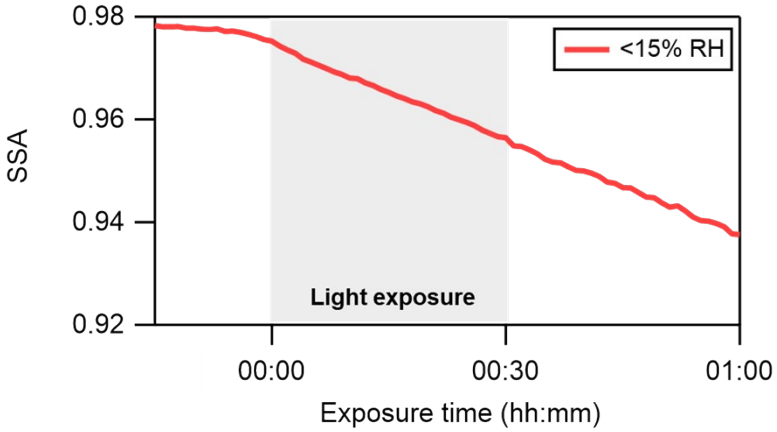

Figure S7. Single scattering albedo from a 30 min UVA light exposure experiment on BrC at dry conditions. Reported values are from the PASS at 405 nm. Aging in the dark following light exposure was extended to 30 min.

Table S1. Average starting SSA values for both dry (<15% RH) and 45% RH conditions inside the chamber. The values were taken approximately 15 min before the start of light exposure.

	Average starting SSA	**Standard deviation**
<15% RH (n = 6)	0.965	0.012
45% RH (n = 2)	0.962	0.012