

1 **Supplementary Information**

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3 **Insights into Secondary Organic Aerosol Formed via Aqueous-phase Reactions of Phenolic**
4 **Compounds Based on High Resolution Mass Spectrometry**

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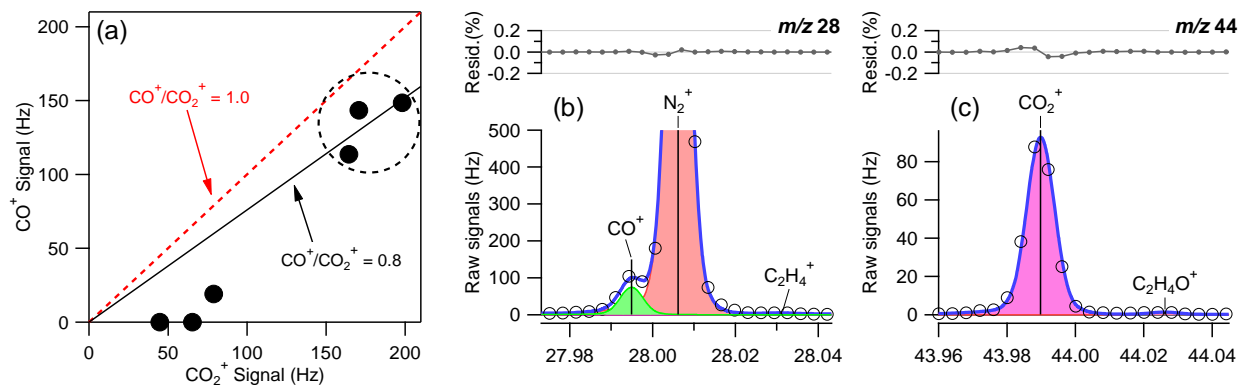
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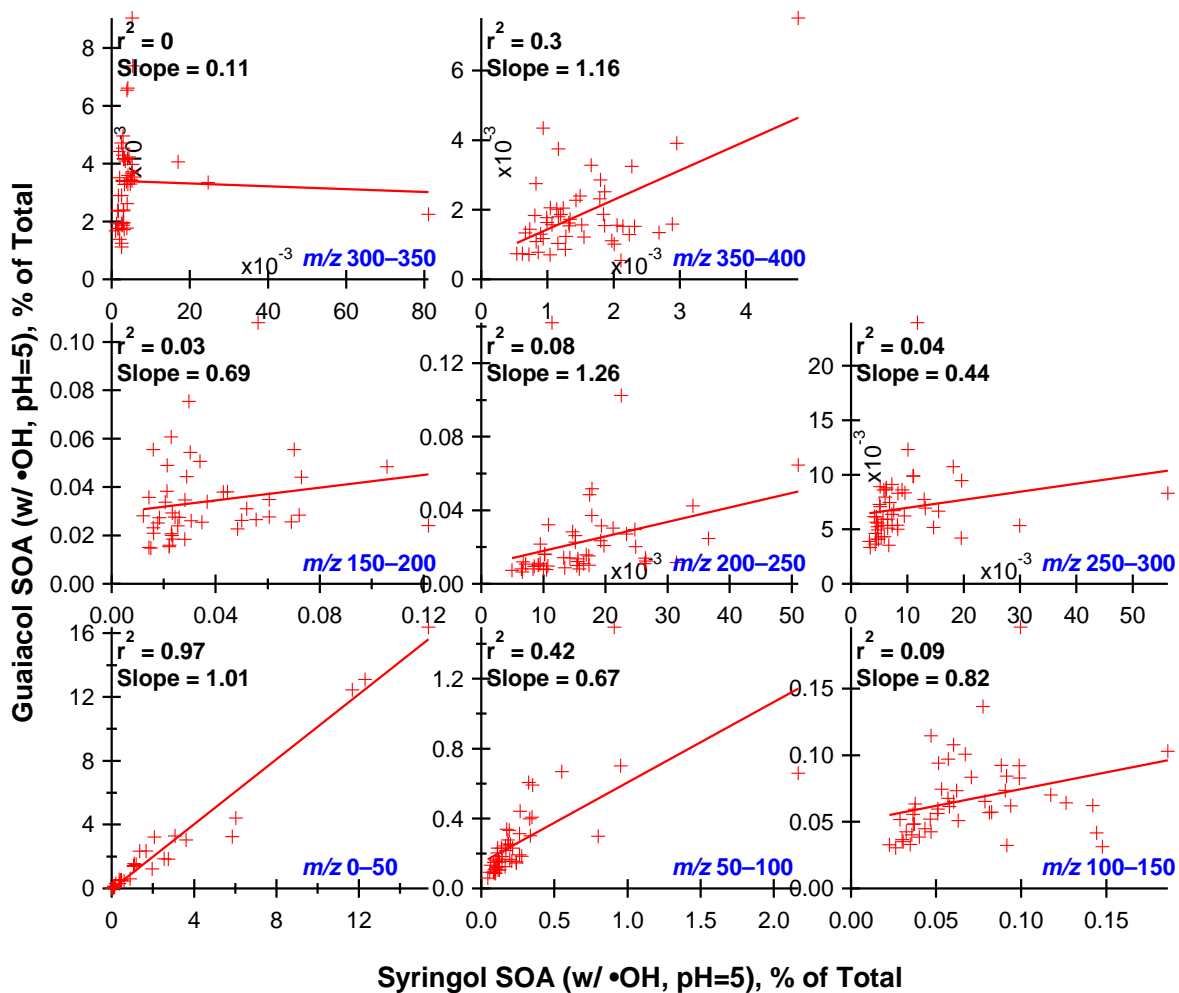
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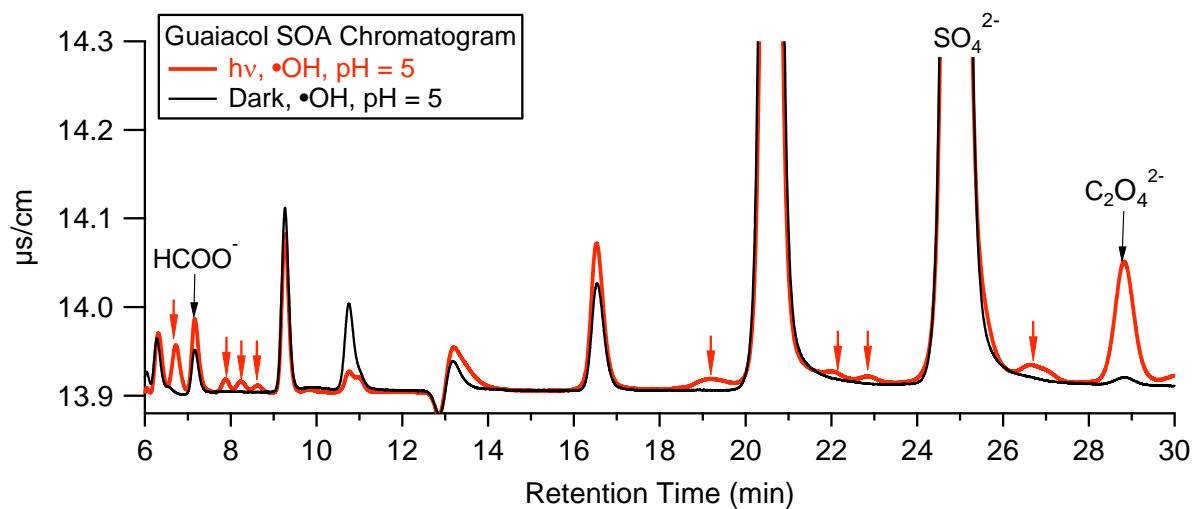
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18 **Fig. S1.** (a): correlations between CO^+ and CO_2^+ signals from PIKA fits for phenolic SOA
 19 products, (b) and (c): raw mass spectra of syringol SOA products (w/ $\bullet\text{OH}$ and $\text{pH}=7$) at m/z 28
 20 and m/z 44 respectively. The shaded areas are the PIKA fits for each ion, and the solid blue line
 21 presents the sum of the PIKA fits. The residual as percent of total fit shown above is $< 0.1\%$ for
 22 both m/z 28 and 44. When CO^+ signal is low, the PIKA fitting of CO^+ might be significantly
 23 biased due to the huge interference of gaseous N_2^+ signal. We therefore determine the average
 24 $\text{CO}^+ / \text{CO}_2^+$ ratio ($= 0.8$) based on three data points with good S/N for CO^+ and CO_2^+ , i.e., the 3
 25 points circled in (a).



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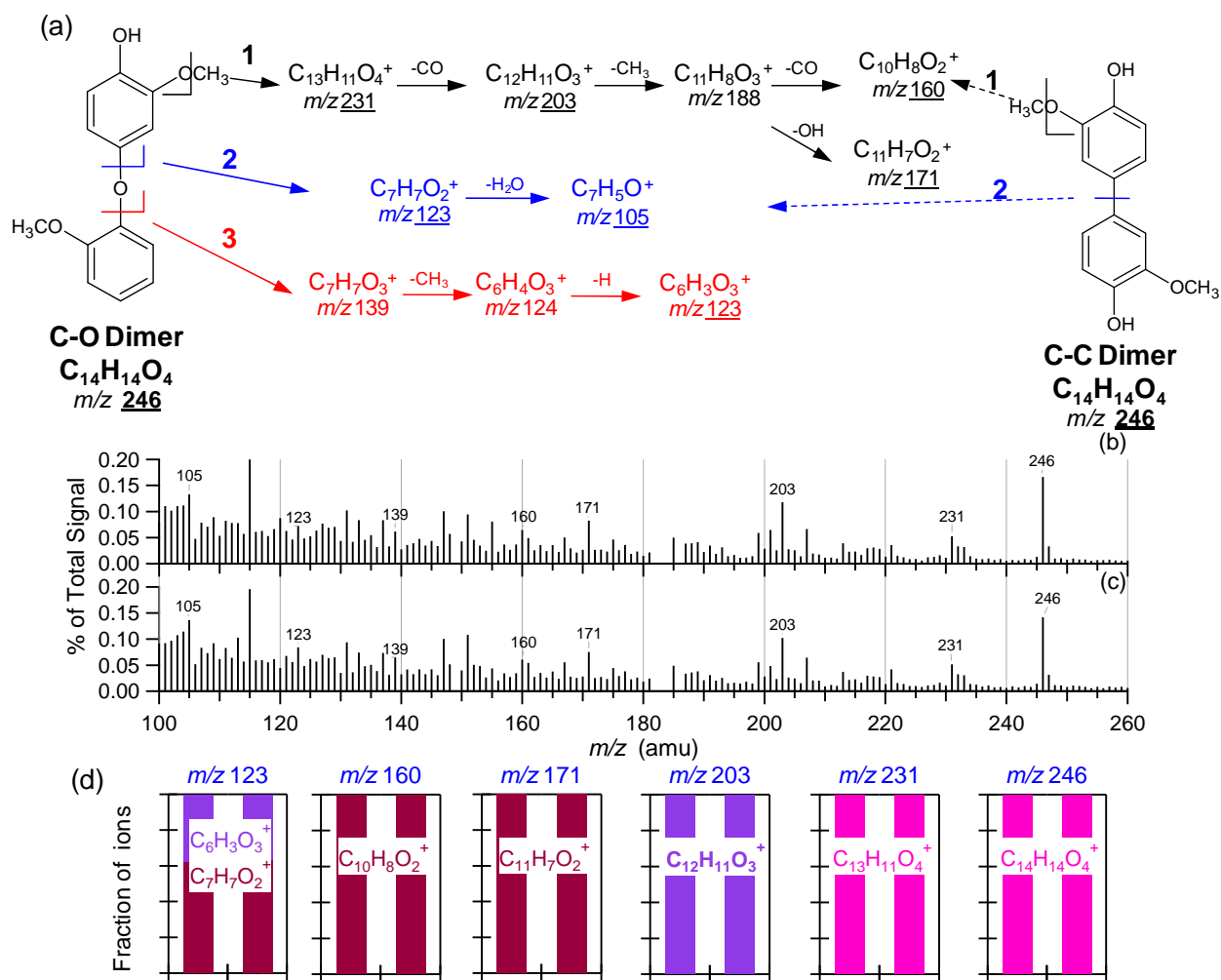
27 **Fig. S2.** UMR spectra correlations between guaiacol and syringol SOA. Both SOA products
 28 were produced in the presence of •OH at pH 5. The mass spectra correlations were performed
 29 separately for each 50 *m/z*'s.



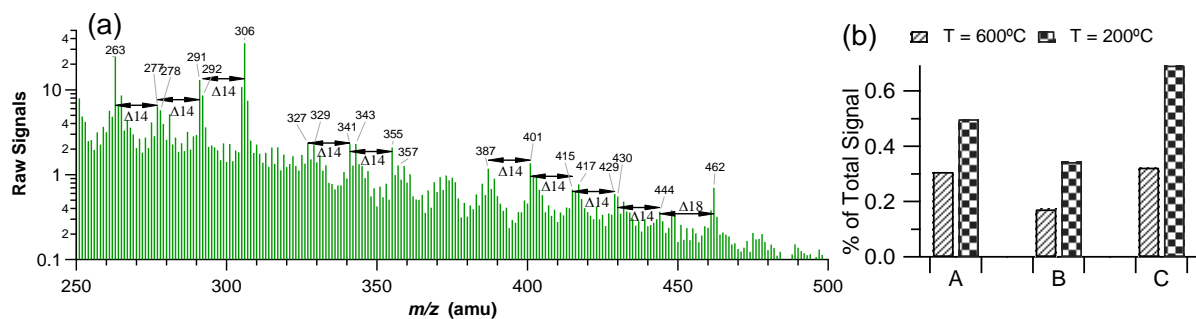
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31 **Fig. S3.** Ion chromatogram of guaiacol SOA produced via aqueous-phase photoreactions in the
32 presence of $\bullet\text{OH}$ at $\text{pH} = 5$. The unidentified peaks are marked in the chromatogram.

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36 **Fig. S4.** (a) Postulated fragmentation mechanism and ions of guaiacol C-C and C-O dimers, (b-c)
 37 AMS UMR spectra (m/z 100 – 260) of guaiacol SOA produced via aqueous-phase
 38 photoreactions under different experimental conditions (b) w/o $\bullet OH$, pH=5, (c) w/ $\bullet OH$, pH=5,
 39 (d) ions as well as their fractions at m/z 's which are significant in (b)-(c) and underscored in (a).
 40 Ions with different number of O in (d) are shown in different colors.



41
 42 **Fig. S5.** (a) UMR spectrum of syringol SOA produced in the presence of $\bullet\text{OH}$ at pH 5, (b)
 43 fraction of m/z 's > 306 to the total signal of SOA produced under different experimental
 44 conditions (A: w/ $\bullet\text{OH}$, pH=5; B: w/ $\bullet\text{OH}$, pH=7; and C: w/o $\bullet\text{OH}$, pH=5) at an AMS vaporizer
 45 temperature (T) of 600°C or 200°C .